354th SIG DET
TM 11-919

INSTRUCTION BOOK
FOR
GASOLINE ENGINE GENERATOR SET
PU-107/U

MANUFACTURED BY
O'KEEFE AND MERRITT COMPANY
ORDER NO. 22693-PHILA-51-11
17 SEPTEMBER 1952

ADDENDA

TO

INSTRUCTION BOOK

Gasoline Engine Generator Set PU-107/U

10 January 1953

Note. The following information changes portions of Instruction Book for Gasoline Engine Generator Set PU-107/U. Personnel using this equipment and having custody of this instruction book, should enter suitable notations beside each affected paragraph and illustration to indicate the presence of the following information.

The igniter assembly has been slightly re-designed so that the drive tongue on the distributor shaft is positioned 23° clockwise from its original location. This change facilitates ignition timing and necessitates the following revisions in the instruction book:

Page 93, Par. 59. Delete the last two sentences of subparagraph *b* (5) and add the following: Always install the oil pump after the igniter assembly has been installed (par. 61 *i*).

Delete the *Note* after subparagraph *b* (5).

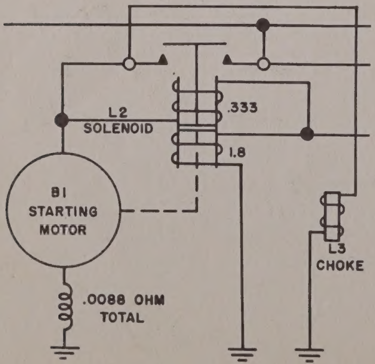
Page 98, Par. 61. Delete the *Note* after subparagraph *i* (2).

Add the following after first sentence of subparagraph *i* (3): Secure with one bolt and two lockwashers.

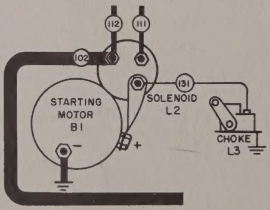
Delete entire subparagraph *i* (4) and substitute the following: Correctly mesh the oil pump gear with the driving gear on the camshaft to allow engagement of the offset drive tongue on the distributor shaft with the pump shaft driving slot. Assembly can be made in only one position as the slot and drive tongue are machined off-center. Always check the position of the rotor and contact points (par. (3) above) after this operation.

The following changes in wiring have been made so that current supplied to the automatic choke does not pass through the instrument panel and relays.

Page 41, Figure 20. Make the following change in Figure 20:



Page 95, Figure 63. Make the following change in Figure 63:



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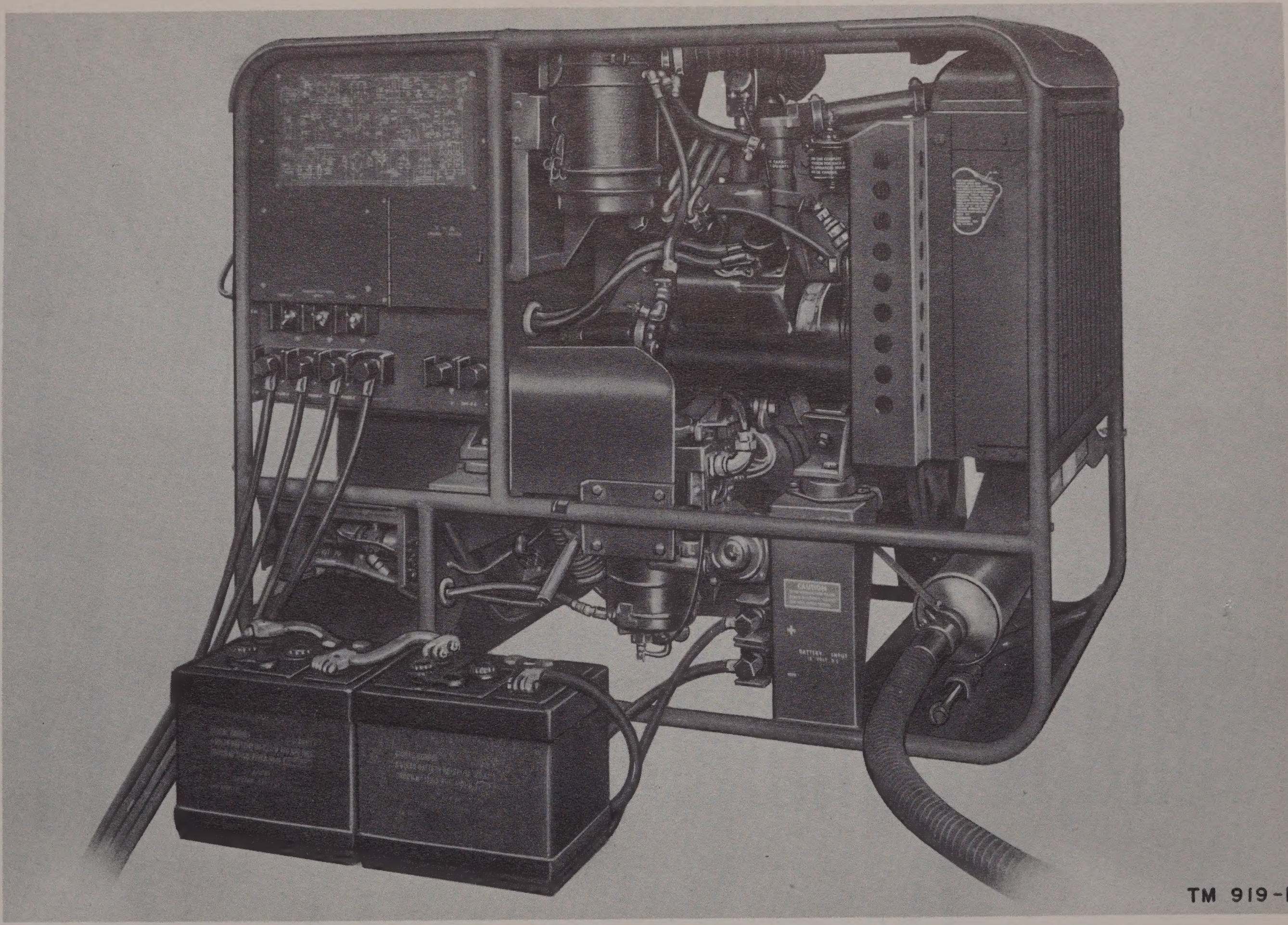

Figure 1. Gasoline Engine Generator Set PU-107/U

Note. This instruction book will be replaced by TM 11-919 which, when published, will be listed in SR 310-20-4.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of all personnel to whom Gasoline Engine Generator Set PU-107/U is issued. The instructions include complete information for operating, servicing, maintaining, and overhauling the generator set. Also included is a detailed description of all major parts of the equipment and a discussion of the theory of operation.

b. Appendix I contains a list of current references, including supply catalogs, technical manuals, technical bulletins, and other available publications applicable to the equipment. Appendix II contains an identification table of parts for Gasoline Engine Generator Set PU-107/U. Appendix III contains a table of all standard nuts, bolts, screws, and washers used in the equipment that are not special items.

2. Forms and Records

a. The following forms will be used for reporting unsatisfactory conditions of Army equipment and in performing preventive maintenance.

(1) DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5 (Army), NAV DEPT SERIAL 85P00 (Navy), and AFR 71-4 (Air Force).

(2) DA AGO Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer, as prescribed in SR 700-45-5.

(3) AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700-45-5 and AFR 65-26.

(4) DA AGO Form 11-260, Operator First Echelon Maintenance Check List for Signal Corps Equipment —Power Units, Reel Units. This form will be used in accordance with instructions appearing on the form. Operations applicable to generator set PU-107/U are listed in paragraph 40.

(5) DA AGO Form 11-261, Second and Third Echelon Maintenance Check List for Signal Corps Equipment—Power Units, Reel Units. This form will be used in accordance with instructions appearing on the form. Operations applicable to Gasoline Engine Generator Set PU-107/U are listed in paragraph 40.

b. The following forms, explained in TM 37-2810, will be used in connection with the operation and maintenance of Signal Corps internal-combustion-engine driven equipment.

(1) DD Form 110 (Vehicle and Equipment Operational Record).

(2) WD AGO Form 460 (Preventive Maintenance Roster).

(3) DA AGO Form 464 (Preventive Maintenance Service and Technical Inspection Work Sheet for Engineer Equipment).

c. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Description of Gasoline Engine Generator Set PU-107/U

Gasoline Engine Generator Set PU-107/U consists of a single-bearing, permanent-magnet type alternator directly coupled to the flywheel of a four-cylinder, four-stroke cycle, gasoline engine. The set also includes a d-c (direct-current) generator, all necessary controls and instruments for regulation of the equipment, and a win-

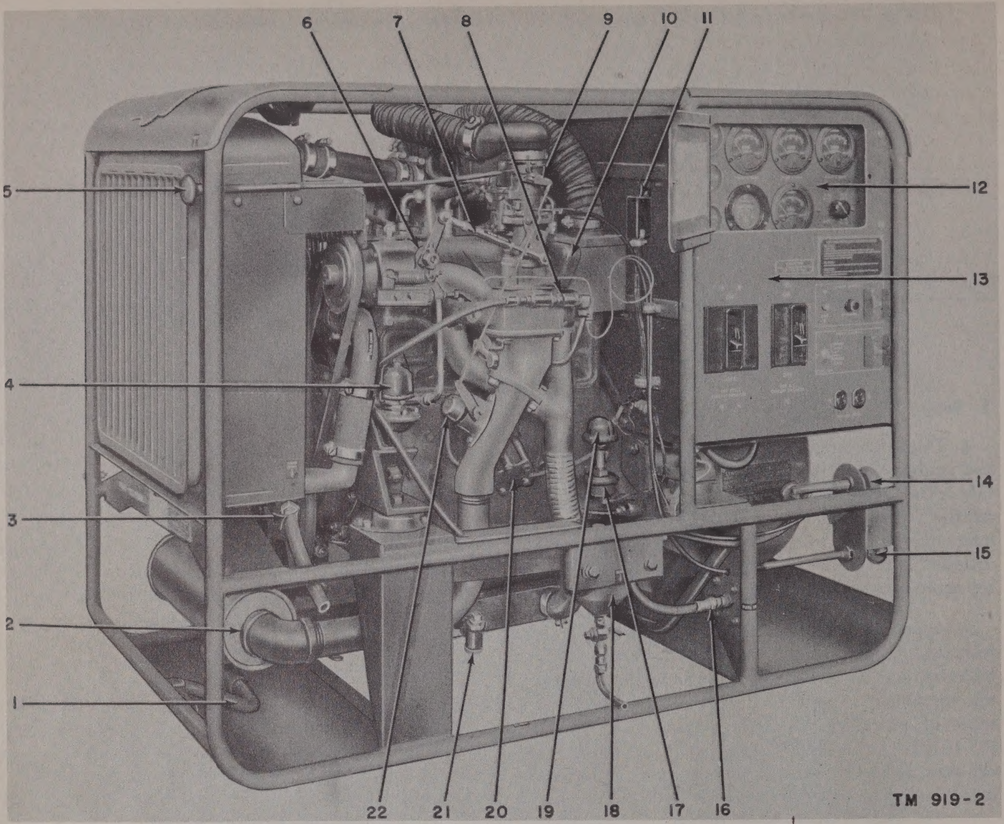

Figure 2. Gasoline Engine Generator Set PU-107/U, right view.

1. Hand crank (A89).
2. Muffler (A38).
3. Radiator drain (H477).
4. Fuel pump (O-99).
5. Manual choke (O-88).
6. Engine speed governor (O-126).
7. Carburetor-to-governor linkage (O-129).
8. Ventilating control valve (O-73).
9. Carburetor (O-108).
10. Engine overspeed safety governor (O-128).
11. Ten-conductor socket (J2).
12. Instrument panel (A65).
13. Control panel.
14. Primer pump (O-89).
15. Manual throttle (O-90).
16. Auxiliary fuel line adapter (A17).
17. Low-oil-pressure cutoff switch (S2).
18. Fuel filter (O-92).
19. Oil pressure transmitter (E8).
20. Oil pump (O-82).
21. Crankcase drain.
22. Automatic choke (L3).

terization system designed to facilitate starting the unit in extremely cold ambient temperatures. The entire unit is mounted within a welded tubular frame structure. The generator set is rated as follows:

a. Ten kw (kilowatts) at .8 power factor, 120 volts ac (alternating current), single-phase, 400 cycles, plus 2.5 kw at 28 volts dc.

b. Ten kw at .8 power factor, 120/208 volts ac, three-phase, 400 cycles, plus 2.5 kw at 28 volts dc.

c. Twelve and one-half kw at .8 power factor, 120 or 208 volts ac, three-phase, 400 cycles.

4. Application

Gasoline Engine Generator Set PU-107/U is intended as a source of power for the operation of Electronic Search Central AN/GSS-1. Also, it may be used as a source of power for transportable or mobile radar and similar Signal Corps electronic equipment.

5. Major Parts and Assemblies

Note. All left and right designations are assumed from the point of an observer standing at the radiator end, facing the unit.

a. ENGINE. The generator set is powered by an automotive-type Willys No. 807532, L-head, four-stroke cycle, four-cylinder, liquid-cooled, gasoline engine. It develops 30 horsepower at 1,714 rpm (revolutions per minute), has a bore of 3⅛ inches, a stroke of 4⅜ inches,

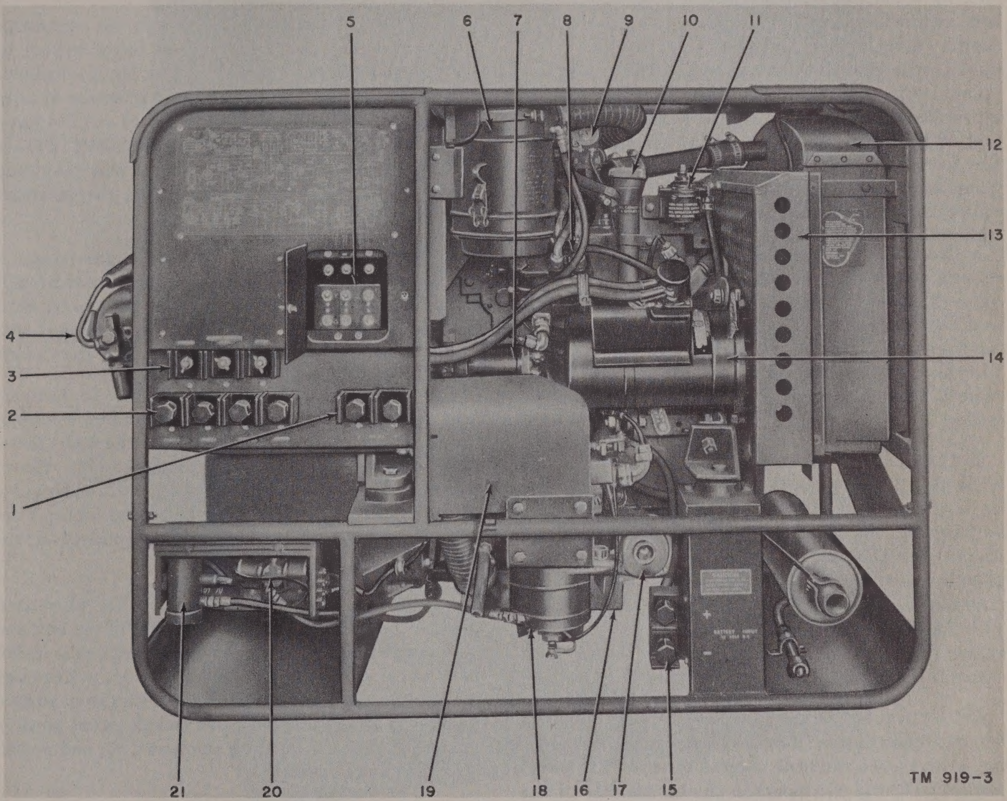

Figure 3. Gasoline Engine Generator Set PU-107/U, left view.

1. D-c output terminals (E16, E17).
2. A-c output terminals (E21 through E24).
3. Remote control terminals (E10 through E12).
4. Fire extinguisher (O-162).
5. Wye-delta change board (TB7).
6. Air cleaner (O-113).
7. Starting motor (B1).
8. Igniter assembly (E6).
9. High-coolant-temperature cutoff switch (S3).
10. Oil filler tube (A5).
11. Oil filter (O-87).
12. Radiator (A39).
13. Fan guard (A41).
14. D-c generator (G1).
15. Battery input terminals (E18, E19).
16. Heat exchanger pan (A61).
17. Heater blower motor (B2).
18. Heater (O-155).
19. Heater shield (A80).
20. Heater fuel control valve (L4).
21. Heater fuel pump (L5).

and a piston displacement of 134.2 cubic inches. The engine is designed for continuous duty, constant-speed operation using fuel conforming to specification MIL-G-3056 and engine oil conforming to specification MIL-O-2104.

b. FUEL SYSTEM (fig. 2). The major components of the fuel system include a disk-type fuel filter (18, fig. 2), a reciprocating-diaphragm fuel pump (4) with a lever for manual operation, a downdraft carburetor (9) with adjustable idling and altitude jets, an oil-bath air cleaner (6, fig. 3), and an automatic electric choke (22, fig. 2). Also provided are a manual choke (5), and a primer pump (14). A manually operated throttle (15) is provided for overriding the governor to permit operation of the engine at idling speeds. An auxiliary fuel line, furnished with the unit, is used to connect the fuel pump to the fuel supply source. (The generator set is not equipped with an integral fuel tank.)

c. COOLING SYSTEM (fig. 3). The cooling system consists essentially of a standard tubular-cell radiator (12), engine-driven water pump, pusher-type fan, bypass thermostat, and an adjustable coolant temperature cutoff switch (9). The switch is set at the factory to open the ignition circuit when the coolant temperature exceeds 200° F. Capacity of the cooling system is 16 quarts.

d. LUBRICATION SYSTEM. Circulation of the engine lubricating oil is provided by a gear-type oil pump (20, fig. 2) driven from a spiral gear on the camshaft. An oil filter (11, fig. 3) is mounted on the left side of the engine. A bayonet-type gage, in the oil filler tube, is provided to permit checking the oil level in the engine crankcase (10, fig. 3). A low-oil-pressure cutoff switch (17, fig. 2) opens the ignition circuit and stops the engine whenever the oil pressure drops below 5 psi (pounds per square inch).

e. IGNITION SYSTEM. The 6-volt battery ignition system derives its current through a dropping resistor (10, fig. 4) from two externally located batteries. An igniter assembly (8, fig. 3), mounted on the left side of the engine, consists of a camshaft-driven distributor, a capacitor, and an ignition coil. The spark plugs and ignition cables are suitably waterproofed and are shielded to prevent radio frequency radiation. An IGNITION MANUAL START—REMOTE START switch (16, fig. 11) is located on the control panel.

f. STARTING SYSTEM. A 12-volt d-c, solenoid-controlled starting motor (7, fig. 3), mounted on the left side of the engine, is energized by two 6-volt batteries connected in series. The starting system also includes a start relay (11, fig. 4), a hold relay (8, fig. 4), and a battery-charging relay (12, fig. 4). A START—STOP switch (15, fig. 11) is located on the control panel. The batteries are charged by means of a dry-disk selenium rectifier (7, fig. 4) and a transformer (2, fig. 4). A hand crank (1, fig. 2) for manual starting is mounted on the front skid in the lower frame. Facilities are provided, also, for starting and stopping the unit from a remote station. Packaged with the unit is one 6-foot cable for connecting the batteries to the start solenoid, one 6-foot cable for connecting the batteries to ground, and one short cable for the battery-to-battery connection.

g. D-C GENERATOR. In addition to the alternating current produced, the unit develops direct current by means of a 28-volt d-c generator (14, fig. 3) mounted on the left side of the engine. This generator is rated at 2.5 kw at 4,550 rpm (with engine speed at 1,714 rpm) and is belt-driven from the engine crankshaft. The d-c generator voltage is controlled automatically by a voltage regulator (5, fig. 4) mounted on the alternator stator housing.

h. EXHAUST SYSTEM (fig. 2). The engine exhaust is carried by rigid pipe to the muffler (2), located laterally across the front of the unit, below the radiator. A flexible exhaust extension tube, 10 feet long, equipped with adapters for ease in attachment to the muffler is provided.

i. WINTERIZATION SYSTEM (fig. 3). To facilitate starting the equipment in low temperatures, a winterization system is incorporated within the unit. Major components of the system include a heater (18), blower motor (17), electric fuel pump (21), fuel control valve (20), heat exchanger pan (16), and metal tubing. Controls for operating this system are incorporated on the control panel (fig. 11).

j. INSTRUMENT PANEL (fig. 11.). The instrument panel is shock-mounted on the right side of the unit and is accessible through a hinged door. Located on the instrument panel are three ammeters (7, 8, 9), a frequency meter (4), a voltmeter (10), and a voltmeter selector switch (11). Engine instruments include an oil pressure gage (5), a battery-charging ammeter (3), and a coolant temperature gage (6).

k. CONTROL PANEL (fig. 11). Located below the instrument panel are the controls necessary to operate the unit. These controls include toggle switches for starting the equipment, an a-c circuit breaker (1), a d-c circuit breaker (2), and a duplex outlet receptacle (17). Controls for the winterization system include a RUN—START toggle switch (13) for starting the heater, an indicator lamp (12), and a circuit breaker (14).

l. ALTERNATOR. The alternator (1, fig. 4) is of the permanent-magnet type with 28 poles, resulting in a frequency of 400 cps (cycles per second) at the synchronous speed of 1,714 rpm. The alternator is rated at 12.5 kw at .8 power factor, 120 or 208 volts, three-phase, 4

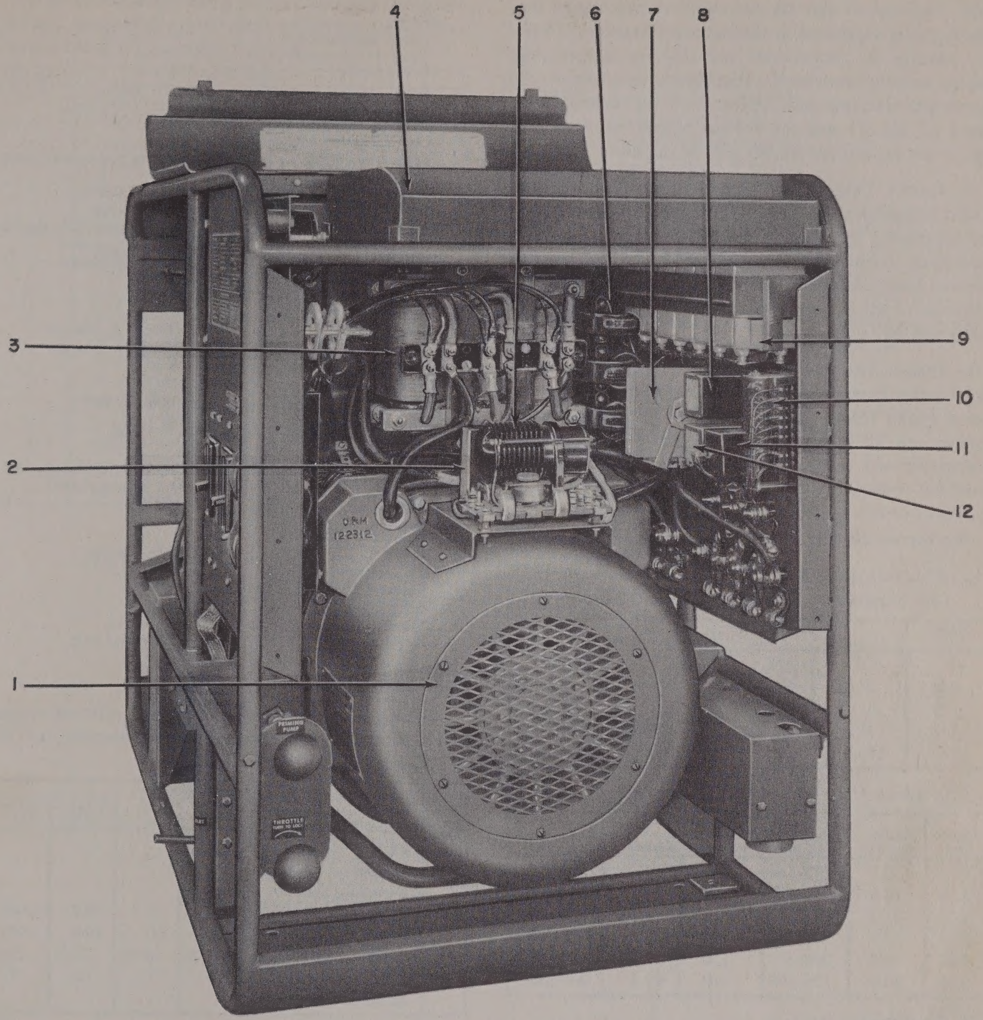
4
5
6
7
8
3
9
10
11
2
12
1
PRIMING PUMP
THROTTLE TURN TO LOCK
O.R.M. 122312
TM 919-4

Figure 4. Gasoline Engine Generator Set PU-107/U, rear view.

1. Alternator (G2).
2. Battery-charging transformer (T3).
3. Compensator transformer (T2).
4. Tool trays (A74, A76).
5. D-c voltage regulator (VR1).
6. Ammeter current transformers (T4 through T6).
7. Battery-charging selenium rectifier (CR2).
8. Hold relay (K2).
9. Compensator capacitors (C16 through C21).
10. Ignition dropping resistor (R1).
11. Start relay (K1).
12. Battery-charging relay (K3).

wire. The rotor is directly connected to the engine flywheel and is supported at the outboard end by a single ball bearing. A compensator assembly for maintaining voltage stability consists of a three-phase transformer (3, fig. 4) and six capacitors (9, fig. 4). A wye-delta change board (5, fig. 3) and the voltage output terminals (2, fig. 3) are located on the left side of the unit.

m. RADIO FREQUENCY SUPPRESSION EQUIPMENT. Radio frequencies produced by the operation of the unit are suppressed by shielding, grounded straps, grounded capacitors, resistor-suppressors, and bonds formed by external-internal-toothed lockwashers. A complete description of all suppression equipment is discussed in paragraph 65.

n. FRAME. The entire generator set is assembled within a tubular frame structure comprised of two parts. The lower frame forms a skid and also shock-mounts the engine and alternator. The upper frame mounts the instrument and control panels. A canvas cover is supplied for protection when the unit is not in use.

6. Performance Characteristics

a. ALTERNATING CURRENT.

(1) *Single-phase, 120-volt, .8 power factor.*

Approx load	Amperes	Output volts	Kilowatts	Cycles
0	0	124	0	415-425
1/4	25.5	122-124	2.5	415-425
1/2	52.0	120-122	5.0	405-415
3/4	78.0	120-122	7.5	400-410
Full	104.0	118-120	10.0	400-410

(2) *Three-phase, 208-volt, .8 power factor.*

Approx load	Output amperes	Phase-to-phase output volts	Phase-to-neutral output volts	Kilowatts	Cycles
0	0	215-218	124	0	415-425
1/4	10.0	213-215	123	3.0	415-425
1/2	21.5	210-212	121	6.25	405-415
3/4	32.5	210-212	121	9.5	400-410
Full	43.5	208-211	120	12.5	400-410
5/4	54.0	206-208	119	15.5	390-400

b. DIRECT CURRENT.

Approx load	Output amperes	Output volts	Kilowatts
0	0	27-30	0
1/4	22	27-30	.625
1/2	45	27-30	1.25
3/4	71	27-30	2.0
Full	90	27-30	2.5

7. Condensed Tables of Specifications

a. ENGINE.

Make	Willys-Overland.
Model	No. 807532.
Type	4-stroke cycle.
Type cylinder head	L.
Number of cylinders	4.
Bore	3-1/8 in.
Stroke	4-3/8 in.
Piston displacement	134.2 cu. in.
Compression ratio	6.48 to 1.
Firing order	1-3-4-2.
Speed	1,714 rpm.
Horsepower	30 at 1,714 rpm.
Type cooling	Liquid.
Cooling system capacity	16 qt.
Type lubrication	Pressure and splash system.
Oil capacity	4 qt.
Fuel consumption	2.15 gal per hr.
Air cleaner	Oil-bath type.
Spark plugs	14 mm; integrally shielded and suppressed.
Ignition system	Sealed distributor.
Batteries (2)	6 v each.

b. ALTERNATOR.

Make	O'Keefe & Merritt.
Type	Permanent-magnet.
Poles	28.
Voltage	120/208.
Phase	Single or three.
Cycle	400.
Speed	1,714 rpm.
Power factor	.8.
Ampere rating (maximum)	104 (single-phase). 43.5 (three-phase).
Drive	Direct.

c. D-C GENERATOR.

Make	Leece-Neville.
Type number	2554-G12P.
Voltage	28.5.
Ampere rating	90.
Speed	4,550 rpm.
Drive	Pulley and belt.

8. Tabular Data

a. WEIGHTS AND DIMENSIONS. The table of weights and dimensions of Gasoline Engine Generator Set PU-107/U follows:

Quantity	Item	Dimensions				
		Width (in.)	Length (in.)	Height (in.)	Volume (cu ft)	Weight (lb)
1	Gasoline Engine Generator Set PU-107/U.	28	48	37	28.8	1,225
1	Engine.	24	26	30	10.8	405
1	Alternator.	18.5	11.06	18.88	1.79	259.9
2	Battery (crated), each.	10.25	15	12	1.07	50

b. SPARE PARTS. The spare parts listed below are wrapped individually in moistureproof and fungiproof paper. They are packed in the spare parts tray within the unit.

Quantity	Item
1	Belt, drive, engine fan and d-c generator.
1	Belt, drive, engine speed governor.
1	Capacitor, distributor.
2	Gasket, oil filter bowl.
4	Gasket, fuel filter bowl.
4	Gasket, fuel filter element.
4	Gasket, fuel pump bowl.
1	Electrode, heater.
4	Spark plug.

c. TOOLS. The tools listed below are oiled, wrapped separately in moistureproof and fungiproof paper, and packed in the tool tray within the unit.

Quantity	Item
1	Dresser, ignition contact points.
1	Gage, spark plug and ignition contact points.
1	Hammer, ball peen.
1	Handle, wrench.
1	Bar, sliding, for wrench handle.
1	Oiler, hand.
1	Pliers, combination.
2	Sandpaper, flint.
1	Screw driver.
1	Screw, eye, alternator lifting.
1	Bolt, puller, alternator bearing.
1	Wrench, adjustable.
1	Wrench, box and open end, 3/8 in.
1	Wrench, box and open end, 7/16 in.
1	Wrench, box and open end, 1/2 in.
1	Wrench, box and open end, 9/16 in.
1	Wrench, box and open end, 11/16 in.
1	Wrench, socket, 11/16 in.
1	Wrench, socket, spark plug, 13/16 in.

d. INSTALLATION EQUIPMENT. The following installation equipment is packaged individually and supplied with the unit:

Quantity	Item
1	Adapter, fuel drum.
1	Cable, battery, negative.
1	Cable, battery, positive.
1	Cable, battery-to-battery.
1	Connector, exhaust tubing pipe.
1	Coupling, exhaust tubing lock.
1	Hose, auxiliary fuel line.
1	Tube, flexible exhaust extension.

e. MISCELLANEOUS EQUIPMENT. The following miscellaneous equipment is supplied with the unit:

Quantity	Item
2	Battery, 6-v storage (separately packaged).
1	Bracket, mounting, fire extinguisher.
1	Cover, canvas.
1	Crank, hand.
1	Fire extinguisher.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Siting

Consider the following factors when selecting a site for the installation and operation of Gasoline Engine Generator Set PU-107/U.

a. RELATION TO LOAD. Locate the generator set as near as possible to the electrical load. Excessively long cables from the unit to the load increase line resistance and cause a definite voltage drop.

b. OUTDOOR INSTALLATION. When the unit is to be operated outdoors, select a site that is reasonably dry and solid enough to support the weight of the unit (1,225 pounds). No special foundation is necessary; however, the unit should be operated in as near a level position as possible. If the terrain is soft or muddy, make a foundation out of planks or other similar material. Provide some form of shelter to protect the equipment from the elements.

c. INDOOR INSTALLATION. When the unit is to be operated within a building or inclosure, set the unit so that the radiator is facing a door, window, or other opening through which the hot-air blast from the engine may pass outdoors. If possible, attach a canvas duct to the radiator grill and attach the other end of the duct to the building opening. Connect the flexible exhaust tubing to the muffler outlet and extend the free end of the exhaust tubing to the outside of the building or shelter. Make sure that all exhaust connections are gastight. *Carbon monoxide fumes from a gasoline engine are extremely dangerous and, when inhaled, may cause serious illness or death.* Provide not less than 2 feet of space on all sides of the unit to facilitate working on and operating the equipment.

d. LOCATION OF FUEL SUPPLY. If the unit is to be operated indoors, locate the fuel supply tank outside the inclosure within easy range of the 20-foot long fuel line furnished with the equipment. Do not locate the tank more than 6 feet below the level of the engine fuel pump.

10. Preparation of Foundation

No special foundation is necessary; however, the generator set should be placed on a firm, level surface capable of supporting weight exceeding 1,225 pounds. The base of the packing crate will serve as a temporary foundation in mud or snow.

11. Uncrating, Unpacking, and Checking

Gasoline Engine Generator Set PU-107/U is shipped in three packages. The unit, including all spare parts, tools, and installation equipment, is contained in one large crate. The two batteries are packed in separate boxes.

Note. The bottom of the unit crate is constructed to form a skid and can be used for sliding the unit short distances.

a. UNCRATING AND UNPACKING. Before uncrating and unpacking, place the unit near the site where it will be operated. Uncrate the unit with care to avoid damage. Use a nail puller and other appropriate tools. Be sure to remove all packages and parts within the crate or they may be accidentally discarded with the packing material. When prepared for overseas shipment, the unit is inclosed in waterproof paper and a vaporproof barrier. When prepared for domestic shipment, the vaporproof barrier is not used. Uncrate and unpack the equipment as follows:

(1) Remove the top and sides of the large crate.

(2) Remove the instruction books located on top of the unit.

(3) Remove the waterproof paper and vaporproof barrier sealed around the bottom of the unit.

(4) Remove the canvas cover inclosing the entire unit.

(5) Remove all the packaged installation equipment located in the bottom of the lower frame.

(6) Remove the nuts from the four bolts that secure the unit to the base of the crate. The generator set now can be moved.

(7) Unpack the spare parts and tools (packaged individually in the tool tray in the rear of the unit) only as required.

(8) Do not uncrate the batteries until the unit has been set up for operation.

b. CHECKING. A list of all spare parts and tools packed with the equipment is mounted on the under side of the tool tray cover. Check to be sure the equipment is complete and has not been damaged in shipment and handling.

(1) Check the tools, spare parts, installation equipment, and all major components with the packing lists.

(2) Inspect the over-all unit carefully for damage. Give particular attention to the following: Examine the carburetor, igniter assembly, air cleaner, and fuel pump for dents and breakage. Check the fuel line from the fuel pump to the carburetor for loose connections and kinks. Examine the instruments and controls for damage. Check all wiring for torn insulation and broken wires. If any damage is noted or if the equipment does not check with the packing lists, fill out and forward DD Form 6.

12. Setting Up Equipment

After a suitable location has been chosen (par. 9) and the equipment has been checked (par. 11*b*), set up the unit for operation as follows:

a. MOUNTING ON FOUNDATION. When preparing for permanent indoor installation, bolt the unit down solidly to the floor. Four holes are located in the mounting pads on the bottom four corners of the lower frame. Mount the unit to the floor with ½-inch bolts or lag screws of required length. For outdoor installation, locate the unit on level ground. If this is impossible, the alternator end of the unit must be the lower end. At no time should the generator set be operated in a position more than 10° off level, longitudinally or laterally.

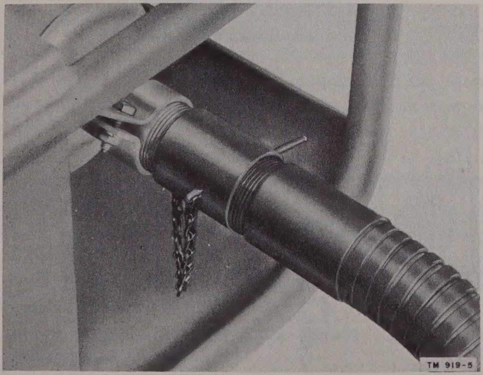

Figure 5. Exhaust tube connection to muffler.

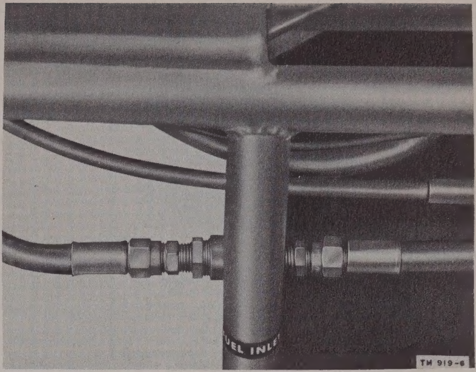

Figure 6. Fuel supply hose connection.

b. CONNECTING EXHAUST TUBE. For indoor operation connect the exhaust extension tube to the muffler as shown in figure 5. Extend the tube to an exterior wall using the most direct route with as few turns as possible. All connections must be gastight. Pitch the tube downward so all condensate will drain out. If the tubing passes through an inflammable wall, install appropriate fireproof insulation.

Warning: Carbon monoxide is deadly poisonous. Inhaling exhaust gases may be fatal.

c. CONNECTING FUEL HOSE. Connect the 20-foot fuel hose to the coupling assembly located near the fuel filter on the right side of the unit as shown in figure 6. Connect the opposite end to the fuel drum adapter. Mount the adapter in an externally located fuel container. Be sure all connections are tight.

d. INSTALLING RADIATOR DUCT. The radiator grill is constructed with a channel flange around the outside edge. For indoor operation, attach a canvas duct to the flange. Use a window or make an opening in an exterior wall and attach the outlet end of the duct. This opening must be at least as large as the radiator grill flange. This will remove the hot blast of air caused by engine operation.

e. INSTALLING FIRE EXTINGUISHER. The fire extinguisher, mounting bracket, and hardware are shipped with the equipment but unassembled to the unit. Mounting holes have been drilled in the rear upper frame panel for mounting the fire-extinguisher bracket. Bolt the bracket to the unit and mount the fire extinguisher in the bracket.

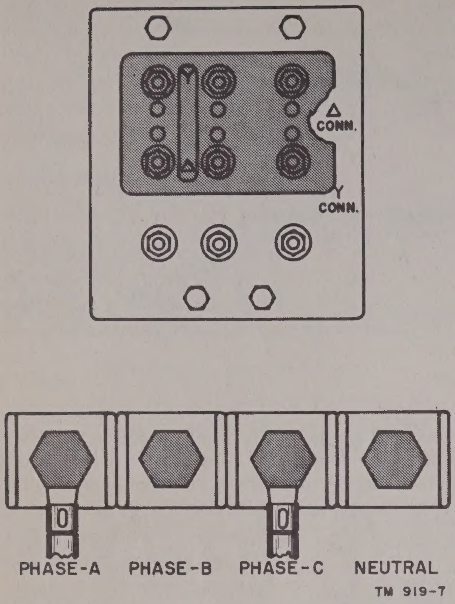

Figure 7. 120-volt, single-phase connections (delta).

13. Removal of Corrosion Preventives

Corrosion preventives are for permanent protection and must not be removed. There are no protective seals installed on the unit.

14. Connections and Interconnections

All internal connections for the operation of the generator set are made at the factory and no additional connections within the unit are needed. Make a-c output connections, d-c output connections, remote start connections, and battery connections as follows:

a. A-C OUTPUT CONNECTIONS. The wye-delta change board and the output terminals are located on the left side of the unit. Sight through the *window* in the change board door to check the a-c output rating in which the generator set is connected. The symbol of the rated load will be either Y (wye) or Δ (delta). To change the voltage connections, open the change board door and remove the six nuts and washers that secure the jumper board to the terminal board. For 120-volt, single-phase, 10-kw operation, connect the jumper board in the delta position. Connect cables from the load to output terminals marked PHASE-A and PHASE-C. Use #0 AWG (American Wire Gauge) cable. For 120/208-volt, three-phase, 12.5-kw operation, connect the jumper board in the wye position. Connect cables from the load to output terminals marked PHASE-A, PHASE-B, PHASE-C, and NEUTRAL (if required). Use #4 AWG cable. Figures 7 and 8 show the proper delta and wye connections.

Warning: Never attempt to change the output rating with the unit in operation.

b. D-C OUTPUT CONNECTIONS. A d-c load of 2.5 kw at 28 volts may be connected to the unit at any time that the total a-c load is not in excess of 10 kw, three-phase or single-phase. Connect the d-c load to the positive (+) and negative (−) output terminals located adjacent to the a-c output terminals on the left side of the unit. Use #0 AWG cable.

c. REMOTE CONTROL CONNECTIONS. Three remote control terminals are located on the left side of the unit, above the a-c output terminals. The terminals are marked COMMON, STOP, and START. By using a three-conductor cable, #14 AWG or larger, the remote location may be extended up to 150 feet. To operate the unit from a remote location, it will be necessary to install a start-stop switch at the remote point. With a single-pole, double-throw, center-off toggle switch, make the following connections:

(1) Connect the cable from the stop terminal on the switch to the remote STOP terminal on the unit.

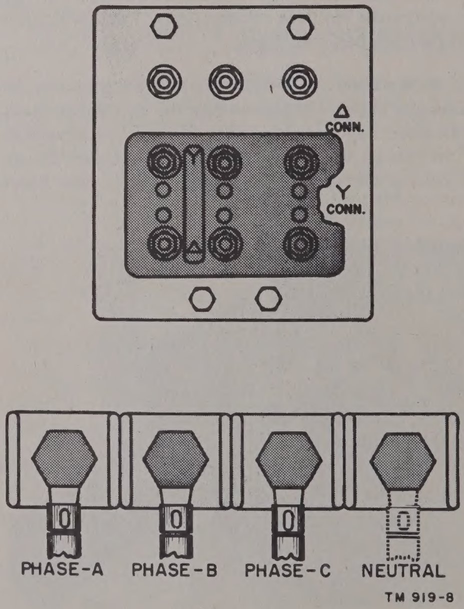

Figure 8. 120/208-volt, three-phase connections (wye).

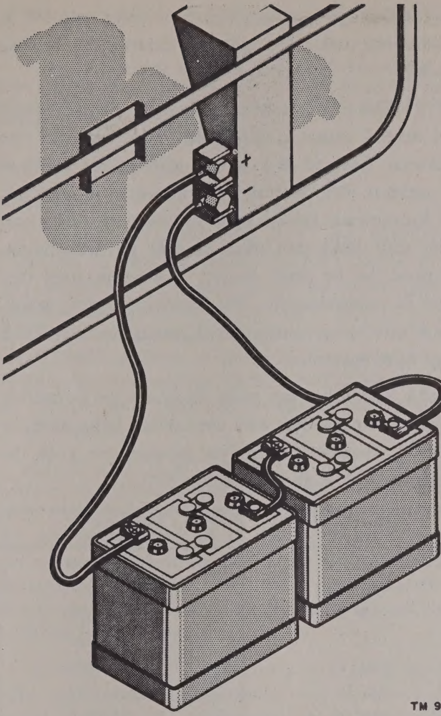

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Figure 9. Battery connections.

(2) Connect the cable from the start terminal on the switch to the remote START terminal on the unit.

(3) Connect the cable from the center terminal on the switch to the remote COMMON terminal on the unit.

d. BATTERY CONNECTIONS. Two terminals for connecting the battery cables are located on the left side of the unit. After preparing the batteries for use as instructed in paragraph 17, position the batteries near the unit and connect them in series as follows: Attach the battery jumper cable from the negative post of one battery to the positive post of the other battery. Connect a cable from the positive (+) terminal on the unit to the battery with the *open* positive post. Connect a cable from the negative (−) terminal on the unit to the battery with the *open* negative post. Figure 9 shows the proper battery connections.

15. Initial Lubrication

Check the crankcase oil drain valve to be sure it is closed. Remove the cap from the oil-filler tube and fill the crankcase with oil as specified in the lubrication chart (fig. 16). The capacity of the lubrication system is 4 quarts. Unfasten the two clamps on the air cleaner and remove the bowl. Clean the bowl with Solvent, dry-cleaning (SD) and fill to the normal oil level mark with oil as specified in the lubrication chart. The remainder of the unit is factory-lubricated and does not require initial preparation.

16. Preparation of Fuel System and Cooling System

a. Connect the fuel supply to the unit as instructed in paragraph 12*c*. Manually crank the engine a few times to make sure that all parts move freely. Operate the hand lever on the fuel pump (fig. 10) to see if it operates freely. If the fuel pump hand lever cannot be moved, crank the engine one complete revolution. If the engine camshaft is in a position where the fuel pump arm is held up by the cam, the fuel pump hand lever cannot be operated. When the fuel pump hand lever can be moved freely, move it up and down until pressure built up within the fuel system prevents further operation of the hand lever. Now push the hand lever down and leave it there. The fuel pump will not operate unless this handle is in the down position. Set the air-inlet gage, on the air cleaner, at the correct position for the temperature in which the unit is to be operated (above 50° F, or below 50° F).

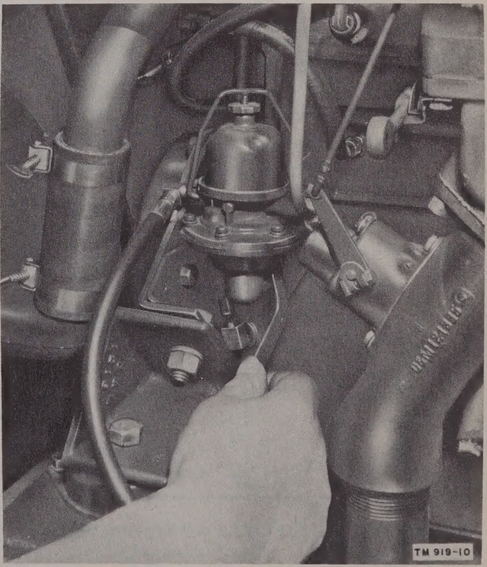


Figure 10. Priming fuel pump.

b. Check the coolant drain cocks on the radiator and on the winterization heater. They must be closed. Fill the cooling system with clean water for use in temperatures above 32° F. In temperatures of 32° F, or lower, add antifreeze in accordance with current directives. The liquid capacity of the cooling system is 16 quarts.

17. Preparation of Storage Batteries

a. INITIAL PREPARATION. The two 6-volt lead-acid storage batteries are shipped in a dry-charged condition. The manufacturer's instructions for preparing the batteries are lettered on each battery. Additional instructions follow:

(1) Remove or destroy any sealing device which may have been used to close or restrict the vent openings.

(2) Fill the cells to 1/2 inch above the separators with electrolyte (sulfuric acid diluted with distilled water). The electrolyte should have a specific gravity of 1.280 at a temperature of 80° F.

Warning: When preparing the electrolyte, add the acid slowly to the water. *Never add water to the acid.*

(3) Allow the batteries to stand from 1 to 4 hours. Check the level of the electrolyte in the cells and, if necessary, add more electrolyte.

b. CHARGING PROCEDURE. If possible, give the batteries a freshening charge as follows: Charge the battery at 8 amperes at an electrolyte temperature of 80° F. Charge until three consecutive readings of voltage and/or specific gravity at 1/2-hour intervals show no increase. During the charging period, the temperature of the electrolyte should not exceed 115° F. The following table gives the specific gravity values for batteries in various states of charge. All the values shown are for electrolyte at the correct filling height and at 80° F.

State of charge	Standard specific gravity in temperate climates
Fully charged.	1.280
75% charged.	1.230
50% charged.	1.180
25% charged.	1.130
Discharged.	1.080

c. TEMPERATURE CHANGES OF SPECIFIC GRAVITY.

(1) The hydrometer readings will be correct only when the electrolyte in the battery is at a temperature of 80° F. If the temperature is higher or lower than 80° F, an allowance must be made to correct the reading obtained.

(2) Draw electrolyte in and out of the hydrometer barrel several times to bring the temperature of the hydrometer float to that of the acid in the cell and then measure the electrolyte temperature in the cell. Some hydrometers have a small thermometer and a correction scale built into them so that the temperature corrections can be made readily. The temperature correction is approximately .004 specific gravity, sometimes referred to as four points of gravity for each 10° F change in temperature.

(3) The following table illustrates the correction for hydrometer readings with the amount to be added or subtracted when the electrolyte temperature (not the air temperature) is above or below 80° F.

Temperature of electrolyte	Specific gravity correction factor
160° F	Add .032
155° F	Add .030
150° F	Add .028
145° F	Add .026
140° F	Add .024
135 °F	Add .022
130° F	Add .020
125° F	Add .018
120° F	Add .016
115° F	Add .014
110° F	Add .012
105° F	Add .010
100° F	Add .008
95° F	Add .006
90° F	Add .004
85° F	Add .002
80° F	.000
75° F	Subtract .002
70° F	Subtract .004
65° F	Subtract .006
60° F	Subtract .008
55° F	Subtract .010
50° F	Subtract .012
45° F	Subtract .014
40° F	Subtract .016
35° F	Subtract .018
30° F	Subtract .020
25° F	Subtract .022
20° F	Subtract .024
15° F	Subtract .026
10° F	Subtract .028

Section II. CONTROLS AND INSTRUMENTS

Note. This section describes, locates, illustrates, and furnishes the operating personnel with information pertaining to the various controls and instruments provided for the proper operation of the equipment.

18. Manual Controls

a. ENGINE.

(1) *Ignition switch* (fig. 11). An IGNITION MANUAL START – REMOTE START toggle switch (16), located on the control panel, selects the ignition circuit for manual or remote starting. If the unit is to be started by hand cranking, place the switch in the MANUAL START position; if the unit is to be started remotely or by means of the START—STOP switch (subpar. (2) below), place the switch in the REMOTE START position.

(2) *START-STOP switch* (fig. 11). The three-position, momentary-contact START—STOP toggle switch (15) is located on the control panel. To start the unit, hold the switch in the START position; to stop the unit, momentarily hold the switch in the STOP position. The switch is designed so that the actuating handle returns to the OFF position (center) when released from the START or STOP position.

(3) *Choke* (fig. 2). To assist in starting the unit while hand cranking, a flexible wire-and-sleeve type manual CHOKE (5) is mounted on the right side of the radiator. Pull the CHOKE out when hand cranking a cold engine. After the unit has started, push the CHOKE in all the way.

Note. Function of the automatic choke (par. 19*a*(5)) is sufficient after the engine has started and manual choking is no longer necessary.

(4) *Throttle* (fig. 2). The manual THROTTLE (15) is a wire-and-sleeve type control mounted on the rear of the unit just below the control panel. Use the manual THROTTLE when it is necessary to run the engine for prolonged periods of no-load operation or when the unit is to be started in a cold temperature and it is necessary to warm up the engine at idling speed. To operate the manual THROTTLE, turn the knob counterclockwise and pull out to decrease engine speed. Lock the THROTTLE in the desired position by turning the knob clockwise.

Caution: Do not apply load to the unit while the manual THROTTLE is in control.

(5) *Priming pump* (fig. 4). The unit is provided with a PRIMING PUMP (14) located just above the manual THROTTLE. Use the pump when starting the unit in low temperatures. To operate the pump, pull the knob out all the way and push it back to its original position. Operate the pump only while the engine is being cranked. One or two strokes usually suffice to start the engine. Be careful not to overprime.

b. D-C GENERATOR. Two manual controls are used in conjunction with the d-c generator: a circuit breaker and a variable voltage resistor. The 28V.-D.C. CIRCUIT BREAKER (2, fig. 11), mounted on the control panel, serves as the main load switch and the overload trip in the d-c circuit. To connect the load, push the trip lever to ON; to disconnect the load, push the trip lever to OFF. The circuit breaker trips off automatically (par. 19*b*(1)) whenever the circuit becomes heavily overloaded. To reset the circuit breaker after it has tripped, push the lever all the way down to the OFF position and then up to the ON position. The variable resistor on the d-c voltage regulator (5, fig. 4) has a range of from 25 to 30 volts. Turn the control knob on the resistor until the desired output is reached.

c. WINTERIZATION SYSTEM (fig. 11). All the winterization system controls are located on the control panel.

(1) *Circuit breaker.* The circuit breaker (RESET) (14) is used as the main switch to connect and disconnect the winterization system circuit. Push the circuit breaker button in all the way to connect the system; pull the button out to disconnect the system. The circuit breaker trips off automatically (par. 19*c*(1)) whenever the circuit becomes heavily overloaded. To reset the circuit breaker after it has tripped, push in the button.

(2) *RUN—START switch.* The RUN—START toggle switch (13) serves to start and run the winterization heater. To start the heater, after the RESET button has been pushed in (subpar. (1) above), hold the switch in the START position 2 to 4 minutes. After the heater OPERATING indicator lamp (subpar. (3) below) flashes on, place the switch in the RUN position. To shut off the heater, place the switch in the off position.

(3) *Heater operating indicator lamp.* The primary purpose of the red indicator lamp (12) is to show when the heater is in operation (par. 19*c*(2)). The lamp also may be used as a check on the power supply to the heater. To check the power supply, be sure the circuit breaker button (subpar. (1) above) is in all the way. Then press the lamp. If power is available, the lamp will glow.

d. ALTERNATOR.

(1) *Circuit breaker* (fig. 11). The 400 CYCLE CIRCUIT BREAKER (1), mounted on the control panel, serves as the main load ON—OFF switch and the overload trip in the a-c circuit. To connect the load, push the trip lever to ON; to disconnect the load, push the trip lever to OFF. The circuit breaker trips off auto-

matically (par. 19*d*(1)) whenever the circuit becomes heavily overloaded. To reset the circuit breaker after it has tripped, push the lever all the way down to the OFF position and then up to the ON position.

(2) *Wye-delta change board* (fig. 3). The wye-delta change board (5), mounted on the left side of the unit, is used to select the output voltage of the alternator, depending on the load requirements. Refer to paragraph 14*a* for instructions on changing the voltage connections by means of the wye-delta change board. The connection can be checked through a window provided in the change board door.

e. MISCELLANEOUS (fig. 11). The 120V.-400 CYCLE duplex receptacle (17), mounted on the control panel, serves as a means of connecting external power for trouble shooting lamps, fans, etc., requiring 120-volt,

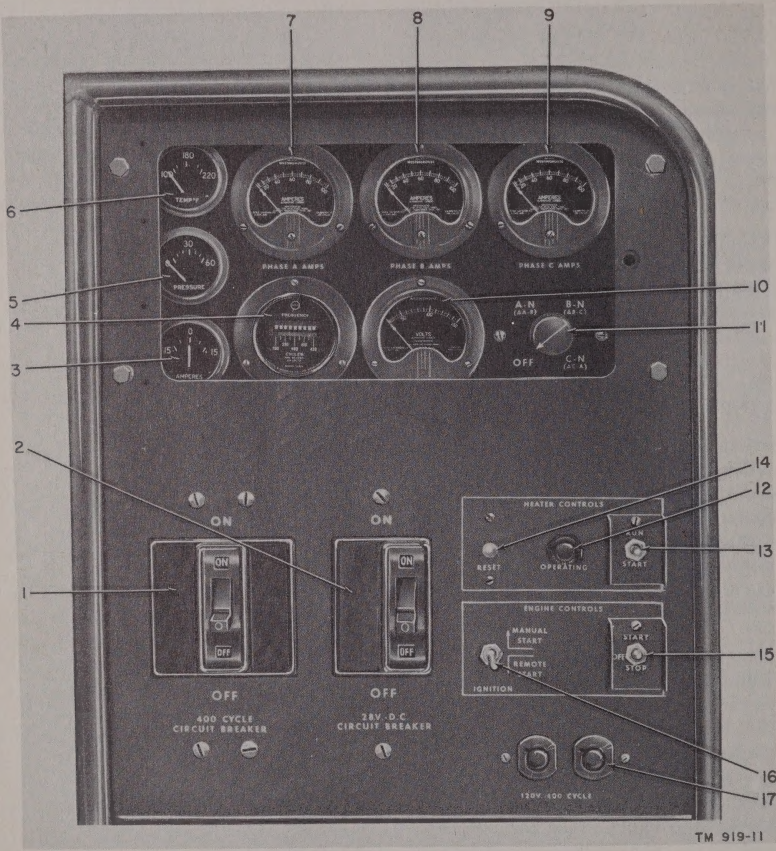

7
8
9
6
5
4
3
10
11
2
14
12
13
1
15
16
17
TEMP °F
PRESSURE
AMPERES
FREQUENCY
PHASE A AMPS
PHASE B AMPS
PHASE C AMPS
VOLTS
A-N (AA-B)
B-N (AB-C)
C-N (AC-A)
OFF
ON
OFF
400 CYCLE CIRCUIT BREAKER
28V.-D.C. CIRCUIT BREAKER
HEATER CONTROLS
RESET
OPERATING
RUN
START
ENGINE CONTROLS
MANUAL START
REMOTE START
IGNITION
START
OFF
STOP
120V. 400 CYCLE
TM 919-11

Figure 11. Instrument and control panel.

1. 400 CYCLE CIRCUIT BREAKER (CB3).
2. 28V.-D.C. CIRCUIT BREAKER (CB1).
3. Battery charging ammeter (M3).
4. Frequency meter (M4).
5. Oil pressure gage (M1).
6. Coolant temperature gage (M2).
7. Ammeter (PHASE A AMPS) (M6).
8. Ammeter (PHASE B AMPS) (M7).
9. Ammeter (PHASE C AMPS) (M8).
10. Voltmeter (M5).
11. Voltmeter selector switch (S8).
12. Heater OPERATING indicator lamp (I-1).
13. Heater RUN—START switch (S7).
14. Heater circuit breaker (RESET) (CB2).
15. START—STOP switch (S4).
16. IGNITION MANUAL START—REMOTE START switch (S1).
17. 120V.-400 CYCLE duplex receptacle (J1).

400-cycle power. The receptacle is of the twist-lock type and contains two connectors.

19. Automatic Controls

a. ENGINE.

(1) *Engine speed governor* (fig. 2). An engine speed governor (6), mounted on the right side of the engine, regulates the speed of the engine which governs the output frequency. The governor is belt-driven from the crankshaft pulley and is connected to the carburetor throttle through an adjustable linkage. The governor is set at the factory and should require no adjustment. However, if an adjustment is necessary, refer to paragraph 25*b* and proceed as instructed.

(2) *Engine overspeed safety governor* (fig. 2). A velocity-type overspeed safety governor (10) is installed between the carburetor and intake manifold. This governor will prevent the engine from running away in case the engine speed governor or its drive belt fails. To check the adjustment of the overspeed safety governor, refer to paragraph 46 and proceed as instructed.

(3) *High coolant temperature cutoff switch* (fig. 3). The engine is equipped with a thermostatically operated high coolant temperature cutoff switch (9) mounted on the cylinder-head coolant outlet elbow. If the coolant temperature exceeds a predetermined value, the switch opens the ignition circuit and thereby stops the engine. The switch is adjustable to permit selection of any desired temperature between 160° F and 220° F. It is set at 200° F at the factory.

(4) *Low oil pressure cutoff switch* (fig. 2). A low oil pressure cutoff switch (17), mounted on the right side of the engine, is provided to open the ignition circuit if the engine oil pressure drops below a safe minimum of approximately 5 psi for engine operation. During starting, and until the engine reaches operating speed, the ignition system will bypass the cutoff switch.

(5) *Automatic choke* (fig. 2). An automatic electric-thermal-type choke (22) is installed on the exhaust pipe adapter below the exhaust manifold. When the engine is cranked electrically, the carburetor is choked automatically to the extent required by the temperature of the engine.

b. D-C GENERATOR.

(1) *Circuit breaker* (fig. 11). The 28V.-D.C. CIRCUIT BREAKER (2), mounted on the control panel, is designed to trip automatically if the circuit becomes heavily overloaded. The thermal trip release is factory-set for time-delay operation and the breaker is sealed. To reset or manually operate the circuit breaker as a load switch, refer to paragraph 18*b*.

(2) *Voltage regulator* (fig. 4). A voltage regulator (5) is mounted on a base secured to the top of the alternator stator housing. The carbon pile voltage regulator controls the 28-volt d-c generator voltage output by automatically controlling the generator-field current.

c. WINTERIZATION SYSTEM.

(1) *Circuit breaker* (fig. 11). The circuit breaker (14) trips automatically when the heater circuit becomes heavily overloaded. For use as a master switch and for the method of resetting, refer to paragraph 18*c*(1). The push-button type circuit breaker is mounted on the control panel and is designated RESET.

(2) *Heater operating indicator lamp* (fig. 11). The heater OPERATING indicator lamp (12), mounted on the control panel, indicates when the heater is operating. The lamp will glow when the heater is burning on either high or low fire, or after the heater has been turned off and is purging itself of fuel. To operate the lamp as a check on the winterization system power supply, refer to paragraph 18*c*(3).

d. ALTERNATOR.

(1) *Circuit breaker* (fig. 11). The 400 CYCLE CIRCUIT BREAKER (1), mounted on the control panel, is designed to trip automatically if the circuit becomes heavily overloaded. The thermal trip release is set at the factory for time-delay operation and the breaker is sealed. To reset or manually operate the circuit breaker as a load switch, refer to paragraph 18*d*(1).

(2) *Compensator assembly* (fig. 4). A compensator assembly, consisting of a three-phase transformer (3) and a network of six capacitors (9), serves as a static voltage regulator by correcting the alternator internal power factor. The compensating transformer is mounted on the firewall above the alternator stator housing. The capacitors are mounted above and to the left of the transformer.

e. BATTERY CHARGING (fig. 4). A dry disk selenium rectifier (7), located on the left side panel, and a constant current transformer (2), located on the voltage regulator base, provide charging current to the batteries. The rectifier changes alternating current to direct current, and the transformer maintains the specified charging rate.

20. Instruments

a. ENGINE INSTRUMENTS (fig. 11). All the engine instruments are located on the instrument panel.

(1) *Oil pressure gage.* The oil pressure gage (5) indicates the pounds per square inch of oil pressure being delivered to the engine bearings. The gage is of the electric type and will not operate unless the batteries

are connected. The gage has a 0 to 60-pound scale, and normal oil pressure is from 15 psi to 21 psi. The pressure will be higher when heavy oil is used or when the engine is cold. When light oil is used or when the engine bearings are worn, the oil pressure will be lower. If the gage indication is not within the correct range, stop the unit and investigate the cause immediately. The oil pressure may be adjusted slightly by the method described in paragraph 25*b*(6).

(2) *Coolant temperature gage.* The coolant temperature gage (6) indicates the temperature of the engine coolant. The gage is of the electric type and will not operate unless the batteries are connected. The scale reading on the gage is from 100° F to 220° F. Normal engine operating temperature is 170° F. If, after warm-up, abnormal temperature is indicated on the gage, proceed as follows: Check the coolant and engine oil level; check the water pump, fan, fan belt, and thermostatic valve for proper operation. Never operate an overheated engine.

(3) *D-c ammeter.* The d-c ammeter (3) indicates the rate, in amperes, at which the batteries are being charged by the selenium rectifier and transformer. The scale reading of the ammeter is from −15 to +15 amperes. At normal operating speed, the ammeter should indicate a charging rate of 1/2 to 5 amperes when the batteries are charged fully. If the batteries are low, the charging rate will be higher. When the heater is operating, the ammeter will show a negative reading. Negative readings also may indicate that the battery leads are reversed or that there is a short circuit in the system. No reading on the ammeter indicates a faulty charging system or a loose or broken connection.

b. ALTERNATOR INSTRUMENTS (fig. 11). All the alternator instruments are located on the instrument panel.

(1) *Voltmeter.* The voltmeter (10) is connected to read phase voltage and has a maximum scale reading of 150 volts. A voltmeter selector switch (11) provides facilities to check the voltage from phase to neutral (A-N, B-N, and C-N) when the unit is connected in wye and from phase to phase (Δ A-B, Δ B-C, and Δ C-A) when the unit is connected in delta. With the alternator operating under full balanced load, the voltmeter will indicate 120 volts in all phases. Under no load, the voltmeter will register about 124 volts. If the voltage is too high or too low, check the frequency meter and adjust the engine speed governor as instructed in paragraph 25*b*.

(2) *Frequency meter.* The frequency meter (4) indicates the cycles per second of the current being produced by the alternator. Engine speed determines the frequency of the alternator. The meter scale provides for indications of 380 to 420 cps. Under stable operation at full load, the frequency meter must indicate 400 cps. Any deviation from the desired reading can be adjusted by changing the engine speed as described in paragraph 25*b*.

(3) *Ammeters.* The three ammeters (7, 8, and 9), connected to the alternator circuit by means of current transformers, register phase current. The ammeters are designated PHASE-A, PHASE-B, and PHASE-C and provide a maximum scale reading of slightly more than 100 amperes. When the alternator is connected for single-phase, 120-volt output (delta), the PHASE-A and PHASE-C ammeters will register 104 amperes under full load. The PHASE-B ammeter will indicate zero. When the alternator is connected for three-phase, 208-volt output (wye) all the ammeters will register 43.5 amperes under full load. Abnormal ammeter readings indicate an unbalanced load, defective ammeters, or defective lines to the load.

Section III. OPERATION UNDER USUAL CONDITIONS

Note. Personnel charged with the operation of the equipment covered in this instruction book will secure DD Form 110 (Vehicle and Equipment Operational Record) and will make appropriate entries thereon.

21. Preliminary Procedure

Before starting, check the unit as follows:

a. FUEL SYSTEM. Check the available fuel supply for the correct grade of fuel (specification MIL-G-3056, type A). Check the auxiliary fuel hose for the proper connections (par. 12*c*). The fuel pump should be primed adequately (par. 16*a*). Examine all fuel fittings for loose connections.

b. COOLING SYSTEM. Be sure the cooling system is filled to capacity (16 quarts) with clean water. Check all hose fittings and drains for evidence of leakage and loose connections. Check the high coolant temperature cutoff switch for proper setting (par. 19*a*(3)).

c. EXHAUST SYSTEM. Check all exhaust connections for proper installation. Be sure the exhaust extension tube is assembled properly as described in paragraph 12*b*. All connections must be gastight.

d. LUBRICATION. The lubrication system must be prepared as instructed in paragraph 15. Recheck to be sure the crankcase oil level is correct.

e. BATTERIES. Check to make sure the batteries have been prepared adequately for use (par. 17) and all cable connections are correct and secure (par. 14*d*).

f. Instrument and Control Panel. All the instruments and controls located on the panel and within the unit should be checked for damage and insecure mounting. All electrical connections should be firm and proper. The circuit breakers must be in the OFF positions unless the unit is to be started remotely.

g. Remote Starting. If the unit is to be operated from a remote location, be sure the connections are correct as instructed in paragraph 14*c*. They must be clean and secure. The circuit breakers must be in the ON positions for remote starting.

h. Output Connections. Check the wye-delta change board for proper setting of desired output. If incorrect, change as instructed in paragraph 14*a*. The output terminals must be connected to the load correctly, and the connections must be secure and clean.

i. General Inspection. Inspect the fan and d-c generator drive belt and the engine speed governor belt for proper tension (par. 46). Check the entire unit for loose nuts, bolts, electrical connections, and fittings. Remove all tools and waste material from around the unit. Be sure the operating location is ventilated properly.

22. Starting

Caution: Except when starting the unit from a remote location, do not attempt to start the unit with the circuit breakers in the ON positions.

a. Electrically. To start the unit electrically, proceed as follows:

(1) Make sure both circuit breakers are in the OFF positions.

(2) Place the IGNITION MANUAL START—REMOTE START switch in the REMOTE START position.

(3) Place the START—STOP switch in the START position and hold it approximately 10 to 15 seconds. If the engine fails to start, release the switch for 10 seconds and then repeat the procedure. If the unit does not start after a few attempts, check the fuel and ignition systems and repeat the starting procedure. If the unit still fails to start, refer to the trouble chart (par. 49) for the possible cause.

(4) Do not operate the hand choke when starting electrically.

(5) To start the unit at idling speed, operate the manual THROTTLE as instructed in paragraph 18*a*(4).

b. Manually. The engine may be started by hand cranking in event the batteries do not supply sufficient power. The batteries must, however, supply enough power for ignition. To start the engine manually, proceed as follows:

(1) Make sure both circuit breakers are in the OFF positions.

(2) Place the IGNITION MANUAL START—REMOTE START switch in the MANUAL START position.

(3) Insert the hand crank and rotate until it engages with the crankshaft.

(4) Pull out the hand choke on the front of the unit if starting in cold temperatures.

(5) Crank the engine by using a strong, quick, upward pull. Repeat as necessary; be careful not to overchoke.

(6) After the engine starts, return the ignition switch to the REMOTE START position and press the START—STOP switch momentarily in the START position. This sets the relays and connects the high coolant temperature cutoff switch and the low oil pressure cutoff switch into the ignition circuit. Also, the unit cannot be stopped unless the ignition switch is in the REMOTE START position. Push the choke in all the way.

c. Remotely. To start the unit from a remote location, connect the remote cables as instructed in paragraph 14*c* and proceed as follows:

(1) Switch the circuit breakers to the ON positions before starting the unit remotely. (It is assumed that there will be a load control at the load location. This control should be in the off position while starting.)

(2) With the IGNITION MANUAL START—REMOTE START switch in the REMOTE START position, the switches located at the remote points serve the same function as the START—STOP switch.

23. Precautions After Starting

Warning: Do not touch the wye-delta change board or the output terminals while the unit is in operation.

a. Check the coolant, fuel, and oil lines for leakage. If leaks have developed, correct them immediately. Stop the unit if necessary.

b. Check the reading of the engine oil pressure gage. It may read high during the first few minutes of operation. After the warm-up period, the gage should read between 15 psi and 21 psi. If a high or low oil pressure reading is observed, shut off the unit and refer to the trouble chart (par. 49) for the possible cause.

c. The battery-charging ammeter should indicate a charging rate of 1/2 to 5 amperes with the batteries fully charged. If no charge or a discharge is indicated, refer to the trouble chart (par. 49) for the possible cause.

d. Observe the readings of the voltmeter and the frequency meter. The voltmeter should register between 120 and 126 volts; the frequency meter should indicate between 400 and 407 cps. The frequency is set at the factory and should be correct. However, if it is necessary to correct the frequency, refer to paragraph 25*b* and adjust the engine speed governor as instructed.

e. The coolant temperature indicated should be 170° F after the warm-up period. If the temperature is above normal, remove the radiator cap and check the coolant level. Add coolant if necessary. Use caution when removing the radiator cap to avoid scalding.

f. After the warm-up period, the crankcase level will be slightly below the full mark because of the oil capacity of the engine speed governor and the oil filter. Stop the engine (par. 26) and check the oil level. Add oil as required.

24. Applying Load

a. Do not apply load to the unit until the engine has warmed up. Be sure the load is within the range of the unit.

b. To apply the a-c or d-c load to the unit, place the appropriate circuit breaker in the ON position. If the a-c load has been applied, check the ammeter, voltmeter, and frequency meter readings. Compare them with the correct readings listed in paragraph 20*b*. Any deviation must be investigated and corrected immediately. If the circuit breaker automatically trips off after applying the load, recheck for overload conditions and incorrect connections. To reset, switch the circuit breaker lever to the OFF position and then to ON. Never manually hold the circuit breaker in the ON position.

25. Operating Procedure

a. INSTRUMENT READINGS. At frequent intervals during load operation, check the reading of the instruments located on the instrument panel. Refer to paragraph 20 for normal instrument indications and the corrections necessary to adjust abnormal readings.

b. ADJUSTMENTS. Adjustments necessary to correct abnormal operation of the unit are explained below.

(1) *Governor adjustment to correct frequency* (fig. 12). If the indicated frequency is abnormal and thereby causes improper voltage output, correct the frequency by adjusting the engine speed governor as follows:

(*a*) With the engine dead, loosen the locknut (1) located on the linkage between the governor and carburetor. Adjust the linkage by turning the sleeve (2) until the dimension A (fig. 12) is approximately 6-7/8 inches. Check the eyebolt dimension B. This should be 7/8 inch. To increase the dimension, loosen the upper adjusting nut (9) and tighten the lower adjusting nut (10). To decrease, loosen the lower adjusting nut (10) and tighten the upper adjusting nut (9).

(*b*) Start the engine. With the unit running at approximately 400 cps under no load, lengthen the linkage by turning the sleeve (2) until an increase in engine speed is effected. Then turn the sleeve back until the governor just begins to take control and the generator frequency is restored to 400 cps. Tighten the locknut.

(*c*) Loosen the two shoulder screws (3) that hold the adjustment slide (4) in place. Loosen the locknut (5) and change the engine speed by turning the adjustment screw (6). (To increase the engine speed, turn the screw clockwise; to decrease the speed, turn the screw counterclockwise.)

(*d*) When the frequency meter indicates 400 cps under load or about 405 cps under no load, secure the adjustment by tightening the locknut (5) and shoulder screws (3). If necessary, readjust the linkage between the governor and carburetor (subpars. (*a*) and (*b*) above).

(2) *Governor adjustment to correct engine surge under no load* (fig. 12). If the engine is hunting or surging under no load, correct the condition by adjusting the engine speed governor as follows:

(*a*) Loosen the locknut (8) and turn the bumper screw (7) in, until the engine stops surging. Do not turn the bumper screw in too far or the engine speed will increase and the governor will not function properly.

(*b*) When the bumper screw has been adjusted properly, secure the setting by tightening the locknut (8).

(*c*) If the frequency drop, from no load to rated load, is greater than specified (407 cycles to 400 cycles), decrease dimension B (fig. 12) as follows: Loosen the lower adjusting nut (10) and tighten the upper adjusting nut (9). Then readjust the no-load speed of the engine (subpar. (1)(*c*) above) until a frequency of 405 cps is obtained.

(3) *Governor adjustment to correct engine surge under load* (fig. 12). If the engine is hunting or surging under load, correct the condition by increasing dimension B. To do this, loosen the upper adjusting nut (9) and tighten the lower adjusting nut (10). Readjust the engine no-load speed in accordance with subparagraph (1)(*c*) above.

(4) *D-c voltage regulator adjustment.* If necessary, refer to paragraph 18*b* and adjust the regulator to the desired output as instructed.

(5) *Carburetor adjustments.* The carburetor is provided with two external adjustments, the idle adjusting

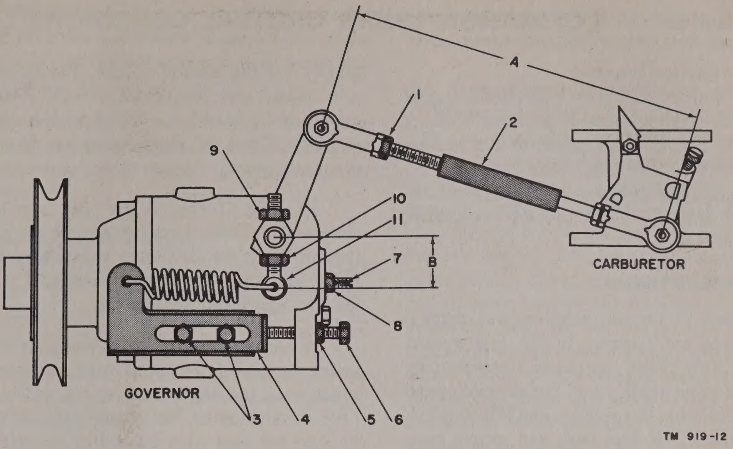


Figure 12. Engine speed governor adjustments.

1. Locknut.
2. Sleeve.
3. Shoulder screw.
4. Adjustment slide.
5. Locknut.
6. Adjustment screw.
7. Bumper screw.
8. Locknut.
9. Upper adjusting nut.
10. Lower adjusting nut.
11. Control arm eyebolt.

screw and the altitude adjusting screw. If, upon investigation, it is determined that the idle jet is definitely out of adjustment, correct the condition as follows: Start the engine and set the hand throttle at approximately 500 to 600 rpm or about one-third normal operating speed under no-load. When the engine has reached a normal operating temperature of 170° F, turn the idle adjusting screw (13, fig. 19) clockwise until the engine starts to falter or roll because of a lean fuel mixture. Do not turn the adjusting screw in too far or the needle valve will become damaged and it will be impossible to obtain the correct adjustment. Then turn the screw in the opposite direction (counterclockwise) until the engine runs smoothly. Proper adjustment ordinarily will be between 1/2 and 1-1/2 turns open (counterclockwise) from a completely closed position. The adjustment should be rechecked after the unit has been operating under load for about 1/2 hour. The altitude adjusting screw has been set at the factory for an air-fuel ratio of 13.0 to 1 at 12.5-kw output. The factory setting has been calculated to give maximum operating efficiency at any altitude up to 5,000 feet. Because special equipment is necessary to adjust the altitude jet (par. 62*f*(2)), operating personnel must *never* attempt adjustment. Adjustment should be made by repair personnel and is necessary only after the carburetor has been overhauled.

(6) *Oil pressure adjustment* (fig. 44). The oil pressure can be altered slightly by adding or removing shims in the relief valve located on the side of the oil pump body. Adding shims between the retainer (9) and the spring (11) will increase the oil pressure. Removing the shims will decrease the oil pressure. This adjustment will change the pressure at load speed but not at idle speed.

26. Stopping

Note. The IGNITION MANUAL START—REMOTE START switch must be in the REMOTE START position before the unit can be stopped.

a. Disconnect the load by throwing the circuit breaker to the OFF position. (If the unit is being operated from a remote point, leave the circuit breaker in the ON position.)

b. Allow the unit to run a few minutes under no load; then stop the unit by momentarily depressing the START—STOP switch in the STOP position.

c. After stopping the engine, check the coolant and engine oil level and add as required. Clean the engine thoroughly and be sure the unit is prepared for the next run. When not in operation, inclose the unit in the canvas cover supplied with the equipment.

27. Operation in Arctic Climates

To operate the unit in subzero temperatures, special precautions must be taken to prevent poor performance or total operational failure. The equipment can operate effectively under extreme cold conditions (to −65° F) only if the procedures listed below are followed carefully. If possible, install the unit in a properly ventilated, heated shelter.

a. SERVICE AND MAINTENANCE.

(1) *Fuel system.* In freezing temperatures, there is danger of water and ice forming in the fuel system. Store the fuel in tightly closed containers. Keep the containers as full as possible at all times. For subzero operation, use fuel conforming to specification MIL-G-3056, type C. If ice forms in the fuel lines and supply tank, proceed as follows: Remove the lines and thaw out the ice. Blow out the moisture with compressed air. Drain off any water which has accumulated in the fuel tank and refill the tank by straining the fuel through a chamois skin.

Warning: Static electricity is created during this process. Be sure there is metallic contact between the funnel and the tank to provide an adequate ground.

(2) *Lubrication.* Because oil and grease congeal easily and gummy parts move sluggishly in arctic weather, it is essential for efficient operation to keep all moving parts clean and dry. If lubrication is necessary, always use Grease, aircraft and instrument (GL). Be sure the carburetor choke valve and shaft are clean. Keep snow, water, and ice from collecting on lubrication points and lubricate more frequently than usual. For subzero operation use engine oil conforming to specification MIL-O-10295 as prescribed in the lubrication chart (fig. 16). If the unit is to remain idle for prolonged periods in subzero temperatures, drain the crankcase.

(3) *Cooling system.* If temperatures below freezing are anticipated, protect the cooling system with antifreeze. Drain the system and refill with a mixture of 50 percent ethylene glycol noncorrosive antifreeze per specification MIL-E-5559 and 50 percent clean water. If the temperature is expected to reach −30° F or lower, drain the system and refill with Antifreeze (arctic), Ordnance stock No. 51-C-1553-755. Do not dilute the arctic type antifreeze.

(4) *Batteries.* When operating the equipment in temperatures below 0° F, remove Batteries BB-221/U and substitute Batteries BB-2221/U. In arctic climates it is essential to keep the battery electrolyte at the proper level and the batteries fully charged. The danger of the electrolyte freezing depends on the full-charge specific gravity and the state of charge. The electrolyte will become mushy with ice crystals at −63° F with the specific gravity at 1.250 and at −18° F with the specific gravity at 1.200. When the batteries are not in use, store them in a warm place.

(5) *Air Cleaner.* If the unit is to be operated in temperatures below freezing, remove the oil from the air cleaner. Wash the air cleaner parts thoroughly in solvent (SD) and blow dry with compressed air. Reassemble the air cleaner and operate dry.

b. STARTING. To facilitate starting in subzero temperatures, the unit is equipped with a winterization system which heats the coolant, engine oil, and intake manifold. (For description of the system, refer to paragraph 5i.) To start the unit with the aid of the winterization system, proceed as follows:

(1) Check the fuel supply and prime the fuel system as instructed in paragraph 16*a*.

(2) Disconnect the automatic choke rod. (The automatic choke must be inoperative when starting in subzero temperature.)

(3) Press the heater RESET button in.

(4) Check the electrical supply by pushing the heater OPERATING indicator lamp. If power is available, the lamp will glow.

(5) Hold the heater START—RUN switch in START position until the indicator lamp flashes on (approximately 2 to 4 minutes). This indicates that the heater has started.

(6) Move the START—RUN switch to RUN position.

Note. The sound of combustion may be heard before the indicator lamp flashes on; however, the switch must not be moved to the RUN position until the indicator lamp lights. If the lamp does not light within 5 minutes, move the START-RUN switch to OFF position and consult the trouble chart (par. 49).

(7) Keep the heater on for approximately 20 to 30 minutes until the engine is sufficiently warm to start and operate smoothly.

(8) Start the unit in accordance with instructions in paragraph 22. Pull the manual choke out about 1/2 to 3/4 of the way from its closed position. Prime the engine slowly with one stroke of the primer pump while the engine is being cranked. If the engine does not start within 15 to 20 seconds, wait 5 minutes and then repeat the starting procedure.

Caution: Fuel does not vaporize readily in subzero temperatures. Be careful not to overprime.

(9) To stop the heater, move the START—RUN switch to OFF position. The indicator lamp will remain lighted until the heater has purged itself of fuel and will then go out automatically. Pull out the RESET button.

c. STOPPING. Refer to paragraph 26 and stop the unit as instructed. Recheck the arctic service and maintenance instructions; use adequate precautions to protect the unit when not in use.

28. Operation in Desert Climates

Locate the equipment in an area protected from sand and dust. Inspect and clean the equipment more frequently than under normal operating conditions. Keep the unit covered when not in operation.

a. FUEL SYSTEM. Be sure all fuel line connections are tight. Keep the fuel supply tank tightly closed to prevent the entrance of dirt and sand.

b. LUBRICATION. Keep all moving parts well cleaned and lubricated when the unit is being operated in desert areas. Always clean sand, dirt, and the old lubricant from the parts before relubrication. Check and change the engine oil often, depending on the severity of the climate, presence of excessive dust conditions, and frequency of operation.

c. COOLING SYSTEM. Proper ventilation of the cooling system is of prime importance. Keep the system full of clean water, and keep the radiator cap tight.

d. BATTERIES. Check the level of the electrolyte in the batteries more frequently than under normal operating conditions. Keep the vent caps tightly in place.

e. AIR CLEANER. Keep clean oil in the air cleaner to prevent dust from entering the engine. Clean the air cleaner and change the oil at frequent intervals, depending on the severity of the climate. Under these conditions, never operate the unit with the air cleaner dry.

29. Operation in Tropical Climates

When operating in hot, humid climates, the equipment must be provided with unobstructed ventilation. Locate the unit so that it is protected from direct rays of the sun. Shorten the time between normal lubrication periods. Keep the cooling system full of clean water. If the unit is to remain idle for long periods in humid areas, run it every few days for at least an hour to prevent the accumulation of moisture in the stator housing. In tropical climates, prepare the batteries as instructed in paragraph 17 with the following modifications: Batteries operating in tropical climates should use electrolyte of about 1.225 specific gravity when fully charged. This milder strength of acid is less deteriorating to separators and plates, which results in longer battery life. The following table gives the specific gravity values to be used in tropical climates for batteries in various states of charge. The values shown in the table are for electrolyte at the correct filling height and at 80° F.

State of charge	Specific gravity used in tropical climates
Fully charged	1.225
75% charged	1.180
50% charged	1.135
25% charged	1.090
Discharged	1.045

30. Operation in High Altitudes

The unit will operate at rated performance at elevations from sea level to 5,000 feet above sea level with no major adjustments. At high altitudes, however, the engine is more apt to overheat than at sea level. It is important to keep the cooling system full and to provide adequate ventilation.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

31. Catalog Reference

All tools, parts, and equipment supplied with Gasoline Engine Generator Set PU-107/U are listed in paragraph 8 of this manual. See the Department of the Army Supply Catalog SIG 7-&-8-PU-107/U for maintenance parts and stock numbers.

32. Use and Care of Tools

a. USE OF TOOLS.

(1) *General.* The proper use of tools is very important. Improper use will damage the tools and equipment and may result in personal injury.

(2) *Wrenches.* When tightening a nut, bolt, or cap screw, be sure to use the proper wrench for the job. Do not use a wrench that is slightly worn or one that is oversized.This will result in rounding the nut, bolt head, or screw head and may cause damage to the equipment and personal injury if the wrench should slip. Never use pliers for tightening or loosening nuts, bolts, or cap screws. Always use an open-end wrench, a box wrench, or a socket wrench, if available. If none of these are available, use an adjustable wrench. When tightening cylinder-head fastenings, use a torsion wrench, if one is available. Never use a pipe or other means to increase the leverage as this will bend or break the wrench and may strip the threads.

(3) *Screw drivers.* When loosening or tightening a fastening which has a slotted head, use a screw driver with a blade that fits the slot in the head of the fastening. Do not use a wrench or pliers to increase leverage. Be sure to keep the blade of the screw driver square in the slot of the fastening. Never use a screw driver as a pry bar or chisel.

(4) *Other tools.* Specific tools are made for specific purposes. Be sure to use the right tool for the job and that it is of the correct size for the work to be done.

b. CARE OF TOOLS. The condition in which a mechanic keeps his tool equipment is a good indication of his ability. Do not abuse tools by using them for work for which they were never intended. Keep all tool equipment properly stowed and protected from dirt and dampness when they are not in use. After using a tool, clean it thoroughly and replace it in its proper place in the toolbox. Keep all tools free from rust and keep adjustable tools, such as pliers and adjustable wrenches, lubricated. Keep the toolbox clean and free from all foreign matter and debris. After cleaning tools and before putting them away, wipe them with a cloth that has been moistened with oil. For more complete details on the care and use of tools, refer to TM 11-453.

Section II. LUBRICATION AND PRESERVATION

33. Lubricants

The following table lists the lubricants, solvents, and preservative materials approved for use with Gasoline Engine Generator Set PU-107/U.

Symbol	Nomenclature	Specification	Application
OE	Oil, engine	MIL-O-2104	Engine crankcase, air cleaner, igniter assembly.
OES	Oil, engine, subzero	MIL-O-10295	Engine crankcase.
GL	Grease, aircraft and instruments (for low and high temperature)	MIL-G-3278	Carburetor-to-governor linkage bearings, primer pump, throttle, manual choke.
SD	Solvent, dry-cleaning	Federal P-S-661a	Cleaning.
D-40 or D-35	Oil, fuel, Diesel	MIL-F-896	Cleaning.
WB	Grease, general purpose, No. 2	MIL-G-2108	Battery cables and terminals.

34. Lubricating Periods

Lubrication instructions frequently are given in periods of days, weeks, months, half-years, and years. A daily period of operation consists of any consecutive 8-hour period or any number of periods of operation that total 8 hours. A weekly period of operation is any number of operating periods that total 64 hours. A monthly period of operation is any number of operating periods that total 256 hours. A half-yearly period of operation is any number of operating periods that total 1,024 hours. A yearly period of operation is any number of operating periods that total 2,048 hours.

35. Factory Lubricated Parts

a. ALTERNATOR BEARING. The alternator ball bearing is packed at the factory with grease conforming to specification MIL-G-3278. The bearing is a double-seal Fafnir Plya-Seal type. The Plya-Seal is a diaphragm-type contact seal, composed of two members, a flat, flexible sealing washer of synthetic rubber-impregnated fabric, and a split retaining ring of thin spring steel. The two members of the seal can readily be removed for inspection, cleaning, and lubrication. At the time of disassembly and overhaul of the alternator, remove the bearing seals and, if necessary, add new grease, conforming to specification MIL-G-3278. If there is evidence of dirt or grit in the bearing, remove both seals and thoroughly flush the old grease from the bearing with hot oil.

b. WATER PUMP BEARING. The water pump has factory-sealed, prelubricated bearings, and lubrication is not required except during overhaul.

c. HEATER BLOWER MOTOR. The bearings of the heater blower motor are factory lubricated and additional lubrication is unnecessary.

d. STARTING MOTOR. The starting motor bearings are lubricated at the factory. No further lubrication is necessary.

e. D-C GENERATOR. All bearings in the d-c generator are of the same type as used in the alternator. Follow instructions in subparagraph *a* above.

36. Routine Lubrication

a. LUBRICATION ORDERS. Each power unit is provided with an official lubrication order or a lubrication chart. Official lubrication orders are illustrated, numbered, and dated cards or decalcomania labels which prescribe approved lubrication instructions for mechanical equipment which requires lubrication by using organizations. Current lubrication orders should be requisitioned in conformance with instructions and lists in SR 310-20-4. Instructions contained in lubrication orders are mandatory and supersede all conflicting lubrication instructions of an earlier date.

b. LUBRICATION INSTRUCTIONS. The following subparagraphs contain detailed lubrication and cleaning information and are supplementary to the instructions in the lubrication chart (fig. 16).

(1) *Engine crankcase.* Check the crankcase oil level daily (after 8 operating hours) and add oil (OE) if necessary. Change the engine oil weekly (after 64 operating hours). Drain the oil by opening the drain cock located on the right side of the engine oil pan. (Oil should be drained while the engine is warm.) Refill the crankcase with 4 quarts of oil (OE), in accordance with the lubrication chart (fig. 16).

(2) *Air cleaner* (fig. 13). Check the quantity of oil in the air cleaner cup every day (after 8 operating hours). If the oil is below the caution level, add oil (OE) up to the normal level of the cup. At weekly intervals (after 64 operating hours), remove the air cleaner element and wash it in solvent (SD). At the same time, clean the air cleaner cup and refill with engine oil (OE). To remove the element, remove the cup and unscrew the wing screw located on the bottom of the element until free of the element housing. Then pull the element out of the housing. (The wing screw does not come out of the element.)

Note. Whenever the engine crankcase oil is changed, the air cleaner element and cup must be cleaned.

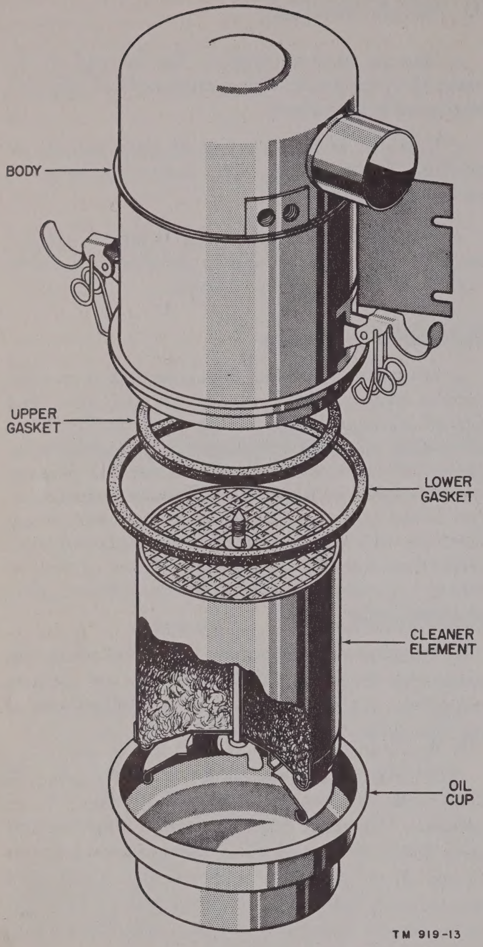


Figure 13. Air cleaner, exploded view.

(3) *Oil filter* (fig. 14). Clean the oil filter element at least once each day (after 8 operating hours) by rotating the external handle one complete turn in either direction. Remove the plug in the filter bowl and drain the oil in the filter with each crankcase oil change (after 64 operating hours). If the handle becomes difficult to rotate, remove the element from the housing and wash it in solvent (SD). Clean the bowl and replace the bowl gasket. If the element disks or blades are damaged, replace the body and element assembly.

(4) *Fuel filter* (fig. 15). After each day of operation (8 operating hours), open the fuel filter drain to remove any accumulated dirt and water. (This is particularly important when operating in damp or cold climates.) At least once each month (after 256 operating hours), remove the filter element and wash it in oil (D-40 or D-35) or solvent (SD). Be careful not to damage the element disks. Worn gaskets must be replaced.

(5) *Fuel pump* (fig. 25). To avoid difficulties created by moisture, remove the fuel pump bowl (2) and strainer screen (4) and clean thoroughly with solvent (SD) at least twice a year (after 1,024 operating hours). Be careful not to bend the screen. Replace the bowl gasket (3) if it is worn or damaged.

(6) *Carburetor-to-governor throttle linkage.* Once each month (after 256 operating hours) or sooner, if necessary, apply grease (GL) to the bearings in the throttle linkage. Use grease only as specified in the lubrication chart.

(7) *Primer pump, throttle, and manual choke.* Once every month (after 256 operating hours) remove all dirt and old grease from the shafts of the priming pump, hand throttle, and manual choke. Apply a thin coat of grease (GL) to the shafts.

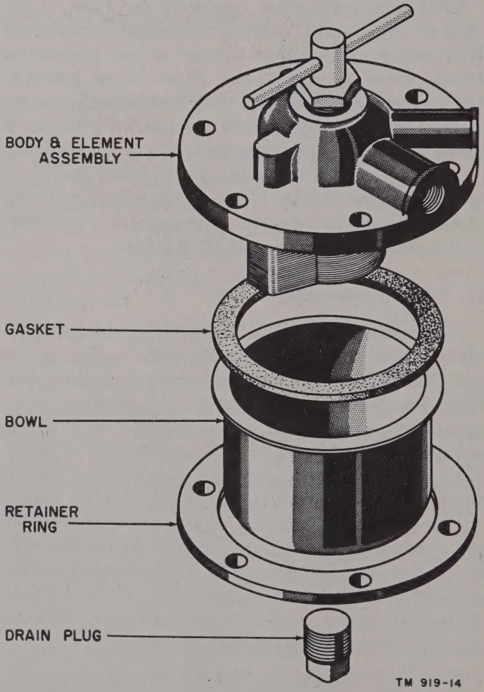


Figure 14. Oil filter, exploded view.

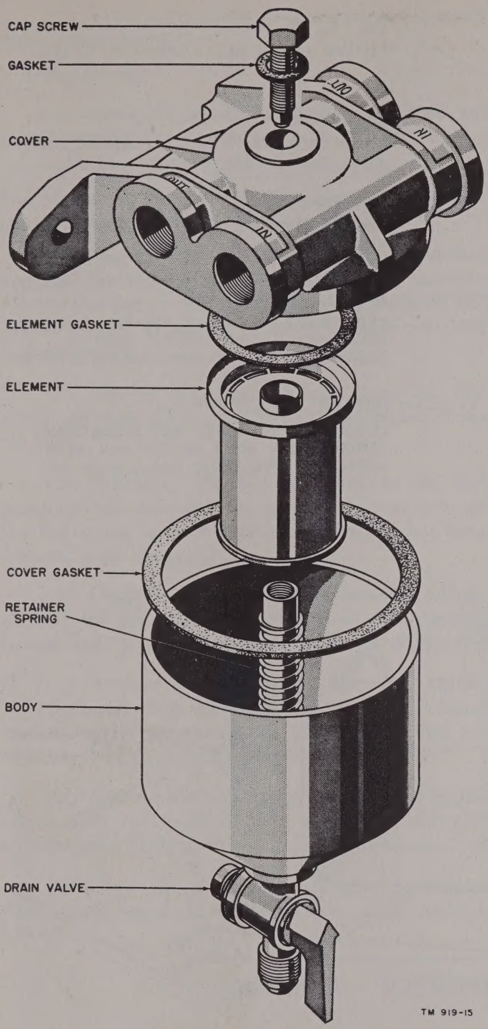


Figure 15. Fuel filter, exploded view.

(8) *Distributor* (fig. 27). Once every 2 months (after 500 operating hours) remove the distributor cap cover and the distributor cap from the igniter assembly. Place 3 to 4 drops of oil (OE) on the felt wick located in the end of the cam sleeve. No additional lubrication is required.

(9) *Heater fuel pump* (fig. 34). When operating the heater every day, remove and clean the heater fuel pump strainer and cover daily (after 8 *unit* operating hours) with solvent (SD) or oil (D-40 or D-35). Apply air pressure to remove any foreign particles which may have accumulated in the small magnetic separator chamber in the center of the pump cover. If the heater is in frequent operation, clean the fuel pump subassembly twice a year (after 1,024 *unit* operating hours) with solvent (SD) or oil (D-40 or D-35). To remove the strainer and subassembly refer to paragraph 54*l* and proceed as instructed.

(10) *Engine speed governor.* The engine speed governor is continuously lubricated from the engine lubrication system. No further lubrication is necessary.

37. Weatherproofing

a. GENERAL. Signal Corps equipment, when operated under severe climatic conditions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. TROPICAL MAINTENANCE. A special moistureproofing and fungiproofing treatment has been devised, which, if properly applied, provides a reasonable degree of protection. This treatment is fully explained in TB SIG 13 and TB SIG 72.

c. LUBRICATION. The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69. Observe all precautions outlined in TB SIG 69 and pay strict attention to all lubrication orders when operating equipment under conditions of extreme cold or heat.

38. Rustproofing

Whenever the equipment is to be placed in storage or is to be out of service for a period of 30 days or more, precautions must be taken to guard against rust and against the formation of gum in the fuel system. Process the equipment as follows:

a. MATERIALS REQUIRED. Requisition the materials below through regular channels and proceed with the rustproofing and gumproofing treatment immediately after shutting down the unit. Rustproofing must be done while the engine is still warm.

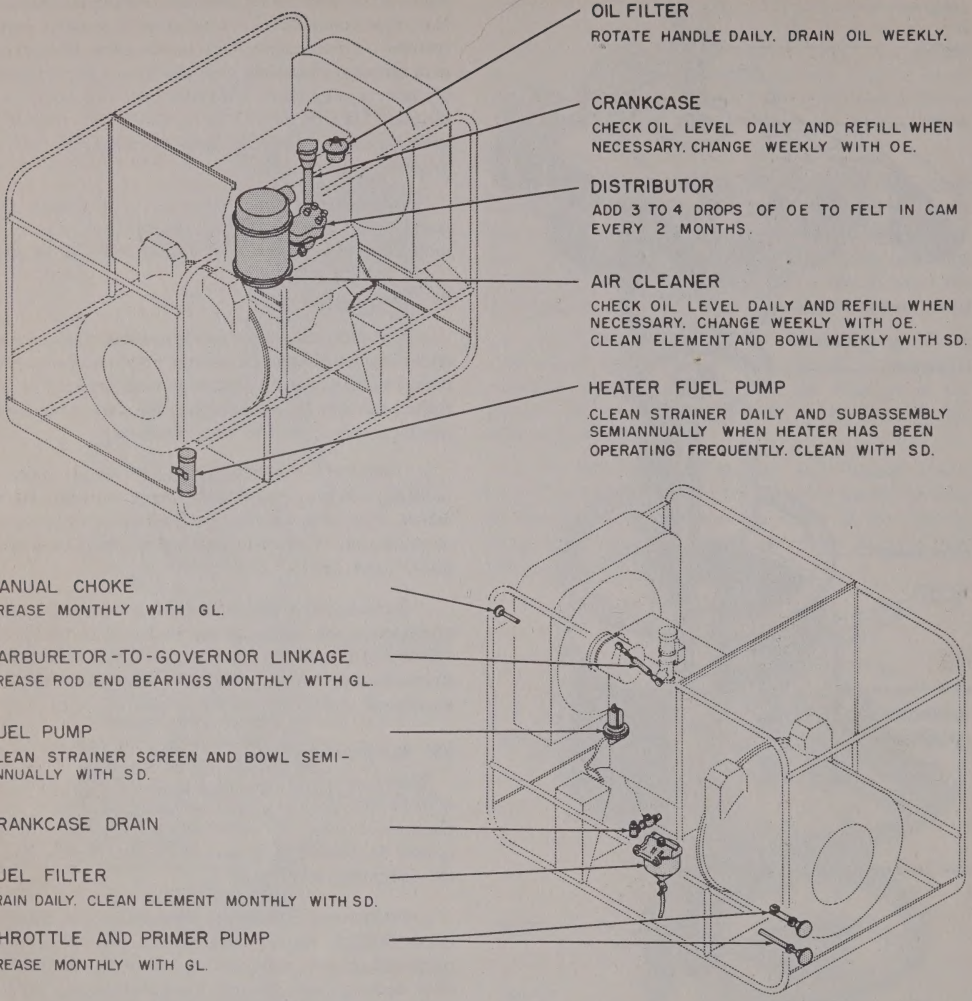
(1) Oil, fuel, Diesel, U. S. Army Specification MIL-F-896.

(2) Oil, engine, U. S. Army Specification 2-104B (Amend. 5).

(3) Oil, lubricating, preservative, special, specification MIL-L-644A.

(4) Compound, insulation, ignition, Ordnance specification 3-182.

(5) Compound, gum preventive, Federal stock No. 51-C1586-225.



OIL FILTER
ROTATE HANDLE DAILY. DRAIN OIL WEEKLY.

CRANKCASE
CHECK OIL LEVEL DAILY AND REFILL WHEN NECESSARY. CHANGE WEEKLY WITH OE.

DISTRIBUTOR
ADD 3 TO 4 DROPS OF OE TO FELT IN CAM EVERY 2 MONTHS.

AIR CLEANER
CHECK OIL LEVEL DAILY AND REFILL WHEN NECESSARY. CHANGE WEEKLY WITH OE. CLEAN ELEMENT AND BOWL WEEKLY WITH SD.

HEATER FUEL PUMP
CLEAN STRAINER DAILY AND SUBASSEMBLY SEMIANNUALLY WHEN HEATER HAS BEEN OPERATING FREQUENTLY. CLEAN WITH SD.

MANUAL CHOKE
GREASE MONTHLY WITH GL.

CARBURETOR-TO-GOVERNOR LINKAGE
GREASE ROD END BEARINGS MONTHLY WITH GL.

FUEL PUMP
CLEAN STRAINER SCREEN AND BOWL SEMIANNUALLY WITH SD.

CRANKCASE DRAIN

FUEL FILTER
DRAIN DAILY. CLEAN ELEMENT MONTHLY WITH SD.

THROTTLE AND PRIMER PUMP
GREASE MONTHLY WITH GL.

---KEY---

LUBRICANT	APPLICATION	TEMPERATURE	
		ABOVE +32° F	+32°F TO 0°F
OE— OIL, ENGINE	CRANKCASE, AIR CLEANER AND DISTRIBUTOR.	OE 30	OE 10
OIL, ENGINE— SPECIFICATION MIL-O-10295	CRANKCASE AND DISTRIBUTOR	BELOW 0°F	
GL— GREASE, AIRCRAFT AND INSTRUMENTS	MANUAL CHOKE, THROTTLE, PRIMER AND CARBURETOR-TO-GOVERNOR LINKAGE	ALL TEMPERATURES	

TM 919-16

Figure 16. Lubrication chart.

(6) Tape, nonhygroscopic, adhesive, Ordnance specification AXS-871.

b. PROCEDURE.

(1) Drain the lubricating system and fill the engine oil reservoir with preservative oil (PL-Special).

(2) Connect the fuel line to a container of 5 gallons of gasoline to which one-quarter of a container of gum preventive compound has been added.

(3) Start the unit and operate it on the gasoline and gum preventive compound mixture for 5 minutes. Lift the free end of the fuel line from the container and permit the unit to stop by pumping the carburetor and fuel system dry.

(4) Remove the sediment bowl from the fuel pump assembly, clean it thoroughly, and replace it on the unit.

(5) Disconnect the fuel line between the fuel pump and the carburetor and operate the hand lever on the fuel pump to make certain that all fuel has been removed from the pump.

(6) Disconnect the fuel line between the carburetor and the priming pump. Make sure that the carburetor and the priming pump are drained completely.

(7) Remove the spark plugs from the engine. Have someone crank the engine and, while it is being cranked, spray preservative oil (PL-Special) into the cylinders through the spark plug holes.

(8) Remove the valve cover from the side of the engine block and spray the valve mechanism with preservative oil (PL-Special).

(9) Drain the preservative oil from the engine. Attach a red tag to the engine oil filler which reads as follows:

Caution: This engine has been rustproofed. Date .... Use engine oil (OE) conforming to U. S. Army Specification 2-104B (Amend. 5), seasonal grade, when placing the unit back in service.

(10) After the engine has cooled, remove all grease, oil, and dirt from the exterior of the unit. Use solvent (SD) for this purpose. Remove all traces of rust and touch up all painted surfaces which have become damaged.

(11) Seal all breathers and breather holes, air intakes, and the exhaust outlet with nonhygroscopic tape.

(12) Make sure that all surfaces are dry, and spray all unpainted surfaces with insulation compound. Include all wiring and electrical equipment. Do not get this compound on the interior of the generators; keep it away from such components as circuit breakers, switches, etc.

39. Painting and Refinishing

When painted surfaces of the equipment become scratched or otherwise damaged, rust and corrosion may be prevented by cleaning thoroughly and then touching up the damaged surfaces.

a. Remove all traces of oil or grease with solvent (SD) and sandpaper thoroughly the portions to be refinished. Apply light, even coats of paint with a small brush. Two light coats are better than one heavy coat.

b. If the painted surfaces have become blistered from heat, remove all old paint with paint remover. Thoroughly sandpaper the surfaces or rub them down with steel wool. Apply a smooth, even priming coat, sandpaper it lightly, and then apply a finish coat.

Caution: Avoid getting paint on moving parts in such a manner as to hinder their movement. Do not paint electrical contacts; avoid getting paint into oil and breather holes.

Section III. PREVENTIVE MAINTENANCE

40. Definition of Preventive Maintenance

a. PURPOSE. Preventive maintenance is a systematic series of operations performed periodically to keep equipment operating at top efficiency. The primary purpose of preventive maintenance is to prevent major break-downs and the consequent need for repair. The primary function of trouble shooting is to locate and correct existing defects.

b. IMPORTANCE. Preventive maintenance is of utmost importance since the failure or inefficient operation of one piece of equipment may cause the failure of an entire system. It is necessary to inspect the power unit systematically each day that it is operated and at weekly intervals, so that defects may be discovered and corrected before they result in serious damage or failure.

c. RESPONSIBILITY. Preventive maintenance services are the responsibility of operating organizations. They comprise the scheduled maintenance services performed by the power unit operator and maintenance personnel, respectively. Ordinarily, the power unit operator will replenish fuel and lubricants. He will perform necessary cleaning operations, tighten loose nuts, bolts, screws, and other fastenings, care for tools and accessories, and make such emergency repairs as are within the scope of his ability, tool equipment, and parts available. He will perform all daily lubrication operations, before operation, at halt (during shut-down periods), and after operation. He will assist the unit mechanic in performing the weekly maintenance on the unit. Maintenance personnel will perform the weekly and monthly maintenance operations with the assistance of the unit operator. The unit mechanic will see that daily lubrication operations have been performed properly by the operator. Any maintenance or repair operations beyond the scope of maintenance personnel will be reported to the officer in charge.

d. DA AGO Form 11-260 Services (fig. 69). DA AGO Form 11-260 is reproduced in figure 69. Operations pertinent to Gasoline Engine Generator Set PU-107/U that appear on this form have been circled on this reproduction. Refer to appropriate paragraphs in this manual for detailed instructions for the performance of operations listed on the form. The fact that an operation, instructions for the performance of which appear in this manual, is not listed on DA AGO Form 11-260 does not excuse the operator or repairman from the performance of such operations.

e. DA AGO Form 11-261 Services (fig. 70). DA AGO Form 11-261 is reproduced in figure 70. Operations pertinent to Gasoline Engine Generator Set PU-107/U that appear on this form have been circled on this reproduction. Refer to appropriate paragraphs in this manual for detailed instructions for the performance of operations listed on the form. The fact that an operation, instructions for the performance of which appear in this manual, is not listed on DA AGO Form 11-261 does not excuse the operator or repairman from the performance of such operations.

f. Operations. Items appearing on DA AGO Form 11-260 and DA AGO Form 11-261 that are applicable to Gasoline Engine Generator Set PU-107/U are as follows:

(1) *DA AGO Form 11-260.*

Item No.	Paragraph reference
1	11*b*
2	21
4	46, items 11, 16, 17, 38, 44
5	46, item 40
6	49 and 46, items 8 and 20
7	21
8	21 and 46, item 47
9	46, items 50 and 173
10	46, items 14 and 41
11	21*i*
12	46, item 18
13	15

(2) *DA AGO Form 11-261.*

Item No.	Paragraph reference
1 through 13	Same as for DA AGO Form 11-260
15	46, items 12, 46, 49
18	46, item 46
20	46, item 49
21	46, items 20 and 39
24	46, item 38
26	46, item 172
28	46, item 13
29	46, items 20 and 21
30	46, item 133

41. Daily Maintenance Services

For purposes of the following instructions, a daily maintenance period is considered to be 8 hours of operation. Daily services will be performed in accordance with DD Form 110 and in the specified sequence.

a. Before Operation. Before operating the unit, perform the following services:

(1) See that the auxiliary fuel hose is connected properly (par. 12*c*) and the fuel pump is fully primed (par. 16*a*). Be sure there is an adequate amount of fuel available.

(2) Check the exhaust extension tube for correct installation (par. 12*b*).

(3) Be sure the cooling system and lubrication system are full. Check the oil level in the air cleaner.

(4) Examine all instruments and controls on the panel for damage and loose electrical connections.

(5) Check the fan and d-c generator drive belt and the engine speed governor drive belt for proper tension (par. 46).

(6) If the unit is to be started other than remotely, be sure the circuit breakers are in the OFF position; if the unit is to be started remotely the circuit breakers should be in the ON position.

(7) Check the wye-delta change board for the proper setting of desired output (par. 14*a*). See that all output connections are correct and well-secured.

(8) Check all fuel, coolant, lubrication, and exhaust connections for evidence of leakage.

(9) Examine the surrounding area for foreign matter and obstructions which may cause damage to the equipment.

(10) Be sure the inclosure in which the unit is to be operated is ventilated properly (par. 9*c*).

b. DURING OPERATION. After the engine has been started (par. 22) and warmed up, perform the following services:

(1) Check the engine instruments for any abnormal indications (par. 20*a*) before applying load.

(2) After the load has been applied, check all the instruments (par. 20) to be sure that the indicated values are within the rated range of the equipment. Check the instrument readings frequently during operation.

(3) Check the fuel supply periodically to avoid running out of fuel.

(4) Always be alert for any evidence of abnormal operation and for unusual noises or conditions.

c. AT HALT. Disconnect the load by placing the circuit breakers in the OFF position; then stop the unit (par. 26) and proceed as follows:

(1) Check the fuel supply, engine coolant level, and engine oil level. Replenish as required.

Caution: If it is necessary to add coolant to a hot engine, restart the unit and slowly add the coolant while the engine is running at idle speed under no load.

(2) Examine all fittings, connections, and gaskets for evidence of leakage.

(3) Inspect the condition of the wiring and check all electrical connections.

(4) Check the entire unit to be sure the equipment is in proper operational order.

d. AFTER OPERATION. Perform the services as instructed in subparagraph *c* above. Then proceed as follows:

(1) Wipe the unit clean as required.

(2) Perform the daily lubrication services as instructed in paragraph 36*b* and as indicated on the lubrication chart (fig. 16).

(3) Add water to the batteries, if necessary.

(4) Correct or report any troubles developed during operation.

(5) Clean all tools and stow them properly.

(6) Perform any function necessary to prepare the unit for the next operation.

42. Weekly Maintenance Services

For purposes of the following instructions, a weekly maintenance period is considered to be 64 operating hours. Perform all daily maintenance and lubrication services as instructed in paragraph 41 and in the lubrication chart (fig. 16). Perform all other weekly services as specified in the W (weekly) column on DA AGO Form 464 (par. 46). Make appropriate entries on the form to indicate the services actually performed and repairs or additional services required.

43. Monthly Maintenance Services

For purposes of the following instructions, a monthly maintenance period is considered to be 256 operating hours. Perform all daily and weekly maintenance and lubrication services as instructed in paragraphs 41 and 42 and in the lubrication chart (fig. 16). Perform all the other monthly services as specified in the M (monthly) column on DA AGO Form 464 (par. 46). Make appropriate entries on the form.

44. Semiannual Maintenance Services

For purposes of the following instructions, a semiannual maintenance period is considered to be 1,024 operating hours. Perform all daily, weekly, and monthly maintenance and lubrication services as instructed in paragraphs 41, 42, and 43 and in the lubrication chart (fig. 16). Perform all other semiannual services as specified in the TI (technical inspection) column on DA AGO Form 464 (par. 46). Make appropriate entries on the form.

45. Annual Maintenance Services

For purposes of the following instructions, an annual maintenance period is considered to be 2,048 operating hours. Perform all daily, weekly, monthly, and semiannual maintenance and lubrication services as instructed in paragraphs 41, 42, 43, and 44 and in the lubrication chart (fig. 16). Perform all other annual services as specified in the TI column on DA AGO Form 464 (par. 46). Make appropriate entries on the form.

Note. Instructions for general repair and overhaul of Gasoline Engine Generator Set PU-107/U are given in chapter 4.

46. DA AGO Form 464 Services

DA AGO Form 464 (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment) is provided as a guide in the performance of necessary periodic services and inspections. Make appropriate entries on this form whenever any of the operations listed are performed. The following are detailed instructions for items on DA AGO Form 464 which apply to Gasoline Engine Generator Set PU-107/U.

TI	M	W	Action
	S	S	1. *Before-operation Services.* Perform all before-operation services as instructed in paragraph 41*a*.
	L	L	2. *Lubrication.* Lubricate the unit as instructed in paragraph 36*b* and in accordance with the lubrication chart (fig. 16).
	C	C	3. *Tools and Equipment.* See that all tools, spare parts, and equipment are present by checking with the packing list on the unit or the tables in paragraph 8*b*, *c*, *d*, and *e*. Examine the condition of the tools and clean them and the tool trays thoroughly. Stow the tools properly.
*	*	*	4. *Fire Extinguishers.* Inspect the condition of the fire extinguisher. See that it is fully charged.
	*	*	5. *Publications.* An adequate supply of DD Form 110 and DA AGO Form 464 should be available. The manual for the equipment and other required publications should be present and in legible condition.
*	*	*	6. *Appearance.* Examine the entire unit for damage to the finish. Remove all traces of rust and dirt. If necessary, refer to paragraph 39 and refinish as instructed.
*	*	*	7. *Modifications.* See that all modification work orders and other directives have been completed.
*	*	*	8. *Noise and Vibration.* (Enter this item on DA AGO Form 464.) While operating the unit, with or without load, be alert for any unusual noises which may indicate trouble. Also, be aware of any excessive vibrations which may indicate loose or damaged parts or inadequate lubrication.
			ENGINE AND ACCESSORIES
	*	*	11. *Cylinder Head, Manifold, and Gaskets.* Check the cylinder head and exhaust manifold for cracks. Examine for coolant, oil, and compression leaks around the cylinder-head gasket and stud nuts. See that the manifold nuts are secure. Check the cylinder-head stud nuts for tightness. Use a torque wrench and tighten each nut to a tension of 60-65 foot-pounds in the sequence shown in figure 62.
*	A		12. *Valve Mechanism.* Remove the valve spring cover and examine the valve mechanism as follows: Remove the metal tube leading from the heat exchanger to the intake manifold. Disconnect the breather tube and the oil hose connected to the valve spring cover. (When disconnecting the oil hose, a small amount of oil from the engine speed governor will be released. Use a small can to catch the oil.) Remove the cover. See that the valve tappets and springs are in good condition and are well-lubricated. Check and, if necessary, adjust all valves to a clearance of .016 inch as instructed in paragraph 62*c*. When replacing the cover be sure it is oil tight.
*			13. *Compression Test.* Before testing the engine for compression, allow the unit to run until normal operating temperature is reached. Remove all the spark plugs and hold a compression gage firmly in the spark plug hole of No. 1 cylinder. Push the manual choke and manual throttle all the way in. Turn the engine with the starting motor until the maximum compression reading is shown on the compression gage. Record the reading in the space provided on Form 464. Perform the test on the remaining three cylinders. The standard compression for each cylinder is 111 psi. Satisfactory engine performance cannot be expected if the compression is below 70 psi or if the reading varies more than 10 pounds between the cylinders. Refer to the trouble chart (par. 49) to determine the cause and remedy for low or variant engine compression.

46. DA AGO Form 464 Services (contd)

TI	M	W	Action
	*	*	14. *Crankcase, Breathers.* With the engine running at idle speed, check the oil pan, gear cover, and valve spring cover for oil leaks. Change oil as instructed in paragraph 36*b*(1) and in the lubrication chart (fig. 16).
C			*Clean.* Semiannually, clean the crankcase ventilating control valve thoroughly in solvent (SD). Be sure all carbon and sludge is removed from the valve and from inside of the valve housing. *Note.* To disassemble the valve a great deal of pressure must be applied to both hex. sections of the valve housing. During reassembly be sure the housing is airtight.
	*	*	15. *Oil Filters, Oil Coolers.* Examine the oil filter, oil lines, and connections for evidence of leakage. Drain the oil in the filter whenever the crankcase oil is changed (par. 36*b*(3) and fig. 16).
*	S	S	16. *Radiator.* Inspect the radiator core and hoses for evidence of leakage. See that the hoses are in good condition and tight. Be sure the radiator is mounted securely. Check the air passages in the core for such obstructions as dirt, insects, and other foreign matter. Remove the obstructions in the core with a stream of compressed air. Examine the coolant for rust or other foreign matter. Test the antifreeze and note in the space provided the lowest temperature to which the unit is protected.
C	C	C	*Clean.* If the coolant is badly contaminated, clean the system in accordance with current directives.
*	*		17. *Water Pump, Fan, Shroud.* Inspect the water pump for evidence of leakage. Tighten the pump mounting bolts. Check the fan blades for nicks and for other signs of damage. Tighten the bolts securing the fan to the pulley.
*	*	*	18. *Belts and Pulleys.* See that the drive pulleys are in good condition and are mounted securely. Examine the two drive belts for evidence of deterioration, wear, and fraying.
A	A	A	*Adjust.* Adjust the engine speed governor drive belt for about 1-inch deflection. Adjust the fan belt for not more than 1/4-inch deflection (at 20 pounds pressure) midway between the fan and the d-c generator pulley. *Note.* The fan belt is of the high-capacity type and, unlike the conventional V belt, must be kept extremely tight at all times.
*	*		19. *Oil Pump, Pressure Relief Valve.* The oil pump will usually require no attention except during major overhaul of the engine (ch. 4). In normal operation the oil pressure should be 15 psi to 21 psi. Check the oil pressure on the oil pressure gage and record the reading in the appropriate space on Form 464. The oil pressure relief valve is an integral part of the oil pump and also requires little attention. However, if it is necessary to adjust the pressure by means of the relief valve, refer to paragraph 25*b*(6) and proceed as instructed.
*	*		20. *Governor and Linkage.* Examine the engine speed governor throttle linkage for any evidence of binding and for wear. See that the linkage is secured properly and operating freely. Once a year (after 2,048 operating hours) disassemble, clean, and inspect the governor as instructed in paragraph 54*a*.
	L		*Lubricate.* Lubricate the throttle linkage as instructed in paragraph 36*b*(6) and in the lubrication chart (fig. 16).
*			21. *Overspeed Safety Governor.* (Enter this item on DA AGO Form 464.) Check the performance of the overspeed safety governor as follows: Remove the screen and bearing cover from the alternator stator housing and place a tachometer against the rotor shaft. Disconnect the carburetor-to-governor throttle linkage. After the engine reaches normal operating temperature, slowly open the throttle. Note the reading of the tachometer at the time the overspeed governor takes control. The governor should cut in at approximately 2,100 rpm. If adjustment is necessary, refer to para-

TI	M	W	Action
			graph 62*e* and proceed as instructed. *Note.* When checking the performance of the overspeed governor, the engine must be in good mechanical condition.
*			22. *Vacuum Test.* (Enter this item on DA AGO Form 464.) Disconnect the igniter assembly air hose from the tee fittings in the intake manifold. Connect a vacuum gage to the fitting. Be sure the connection is tight. Start the engine and allow it to run until normal operating temperature is reached. With the unit running at load speed (1,714 rpm) at an altitude between sea level and 2,000 feet, the vacuum gage should indicate not less than 16 inches of mercury at no load. At higher altitudes deduct 1 inch vacuum for each 1,000 feet of increased altitude. Refer to the trouble chart (par. 49) to determine the cause and remedy for abnormal vacuum indications.
			FUEL SYSTEM
		*	38. *Fuel Pumps and Housing.* See that all connections on the engine fuel pump are well-secured and tight. Note any evidence of leakage.
	C		*Clean.* Clean the filter bowl and screen as instructed in paragraph 36*b*(5) and in the lubrication chart (fig. 16).
	*	*	39. *Carburetor and Linkage.* Examine the carburetor throttle housing gasket, bowl cover gasket, fuel inlet line, and all jets for evidence of leakage. See that the carburetor is mounted securely. Check all the linkage for free operation.
	*	*	40. *Filters.* Check the fuel filter and fittings for evidence of leakage.
	C		*Clean.* Clean the filter element as instructed in paragraph 36*b*(4) and in the lubrication chart (fig. 16).
	*	*	41. *Air Cleaners and Precleaners.* See that the air cleaner hoses are well-secured and in good condition.
	CS	CS	*Clean and Service.* Clean and service the air cleaner as instructed in paragraph 36*b*(2) and in the lubrication chart (fig. 16).
*	*	*	44. *Fuel Lines.* Carefully examine all fuel lines and fittings for evidence of leakage and damage. See that all connections are tight.
			ELECTRIC SYSTEM
*	*		46. *Spark Plugs.* Check for leakage around the spark plug gaskets. Remove the spark plugs and examine for cracked insulation, excessive carbon deposits, and electrode erosion.
C	C		*Clean.* If necessary, clean off carbon deposits by applying an abrasive to the plugs for not more than 3 seconds. (Prolonged use of abrasive will wear away the insulator and electrodes.) Use an air blast to remove loose particles of abrasive. Inspect the spark plug again for cracked insulator. If no spark plug cleaner is available, install new or reconditioned plugs.
A	A		*Adjust.* Measure the spark gap and adjust to .030 inch.
	CS	CS	47. *Battery.* Examine the batteries for cracks and for evidence of leakage. Clean corrosion off the battery terminal posts and cable terminals and lubricate with a light coat of grease (WB). Make sure the cable terminals are well-secured and are making good contact with the battery posts. Check the level of the electrolyte. The level should be 1/2 inch above the separators. If the electrolyte is below this level, add distilled water. Test the voltage of each cell and record the readings on Form 464. Each cell should measure 2 volts. Refer to paragraph 17 and test the specific gravity of each cell as instructed. Record the readings on Form 464.

46. DA AGO Form 464 Services (contd)

TI	M	W	Action
*	*		48. *Starter.* See that the starting motor is mounted securely and that all cable connections are clean and tight. Check the brushes for free movement in the holders. Examine the brushes for wear and replace them if they are worn to two-thirds their original length. To replace the brushes, first remove the starter and commutator end plate. Remove the old brushes by melting the soldered connections. Solder the new brush cables to the terminals and slip the brushes into the holders. Replace the end plate. Refer to paragraph 54*j*(3) and seat-in the brushes as instructed. Check the brush spring tension with a spring scale as instructed in paragraph 54*j*(2).
C	C		*Clean.* If the brushes have been arcing, as evidenced by a dirty commutator, clean the commutator with fine sandpaper (#0000). Blow out the sand with compressed air and seat-in the brushes. If the commutator is dirty or worn to the extent that sandpaper will not clean it, refer to paragraph 54*j*(2) and turn it down in a lathe as instructed.
*	*		49. *Distributor or Magneto.* (The distributor is incorporated in the igniter assembly.) Examine the distributor cap for cracks, carbon, and evidence of arcing. Replace the cap if any of these conditions exist. Clean high tension terminals if corroded. Inspect the rotor for cracks and for evidence of excessive burning at the end of the contact strip. Replace the rotor if any of these conditions are found. Check the capacitor lead for damaged insulation and broken wires. See that the capacitor is well-mounted and the terminal post connections are tight. Test the capacitor with a conventional capacitor tester. Capacitance should be from .18 to .21 uf (microfarad). Examine the contact points. They should be clean and not burned or pitted. If only slightly pitted or burned, resurface the points with the dresser furnished with the unit. If badly pitted or burned, replace the points.
A	A		*Adjust.* Adjust the contact point gap to .020 inch.
L	L		*Lubricate.* Lubricate the distributor in accordance with instructions in paragraph 36*b*(8) and in the lubrication chart (fig. 16).
*	*		50. *Coil, Wiring, Switches.* See that the ignition coil, incorporated in the igniter assembly, is mounted securely and that the cables are in good condition. Examine all wiring for poor connections and worn insulation. Check all switches for correct connections and mountings and for proper operation.
*			53. *High Coolant Temperature Cutoff Switch.* (Enter this item on DA AGO Form 464.) Check the accuracy of the cutoff switch as follows: Insert a thermometer in the upper tank of the radiator. Set the dial of the cutoff switch at 220° F. Cover the radiator and start the engine. When the temperature exceeds 180° F, slowly move the dial counterclockwise until the engine shuts off. The reading on the dial should coincide with the thermometer reading. If the readings differ, adjustment is necessary.
A			*Adjust.* Adjust the cutoff switch as follows: Loosen the two screws in the dial, being careful not to disturb the dial setting. With the screws loose, break the seal on the dial scale and set the scale to correspond with the thermometer reading just taken. Tighten the screws and retest. **Caution:** The factory setting of the dial scale is sealed with compound on both the scale and the central disk of the dial. Do not break this seal except during adjustment.
*			54. *Low Oil Pressure Cutoff Switch.* (Enter this item on DA AGO Form 464). Test the accuracy of the cutoff switch as follows: Remove the switch from the engine. With a pressure regulating valve, pressure gage, and a continuity tester, check the pressure at which the switch opens. If the pressure is above or below 5 psi (plus or minus 1 pound), replace the switch.

46. DA AGO Form 464 Services (contd)

TI	M	W	Action
			CONTROL SYSTEM
*	*	*	57. *Gages.* Observe the oil pressure gage and coolant temperature gage for correct readings. Refer to paragraph 20*a* for normal gage indications. Investigate any abnormal reading.
*	*	*	58. *Meters.* Observe the d-c ammeter, a-c ammeters, voltmeter, and frequency meter for correct readings. Refer to paragraph 20 for normal meter indications. Investigate any abnormal reading.
			FRAMES AND MOUNTINGS
*	*		80. *Frame.* Examine the upper and lower frame for warpage and for cracks around the welds.
*	*		84. *Mountings.* (Enter this item on DA AGO Form 464.) See that the engine and alternator mounting bolts are tight. Examine the condition of the shock mounts.
			MISCELLANEOUS ITEMS
*	*		133. *Radio Frequency Suppression Equipment.* (Enter this item on DA AGO Form 464.) Inspect the condition of all the radio frequency suppression equipment. Make sure that all bonding straps, capacitors, and external-internal-toothed lockwashers are well-secured. Refer to paragraph 65 for suppression equipment details.
			GENERATORS
*	*		172. *Armature, Commutator, Slip Rings.* *D-c Generator.* See that the d-c generator is mounted securely and that all cable connections are clean and tight. To examine the brush rigging, remove the generator from the unit. Then remove the commutator end cover. Check the brushes for free movement in the holders. Test the brush spring pressure. It must be between 1.3 to 2.2 pounds when deflected 1/2 inch. Examine the brushes for wear and replace if worn to one-half their original length. Refer to paragraph 54*i*(2) and seat-in the brushes as instructed.
C	C		*Clean.* Blow out the brush dust from the brush rigging, armature assembly, and field ring assembly with dry, compressed air. If the brushes have been arcing, as evidenced by a dirty commutator, clean with fine sandpaper (#0000). Blow out the sand with compressed air and seat-in the brushes. If the commutator is dirty or worn to the extent that the sandpaper will not clean it, refer to paragraph 54*i*(2) and turn it down in a lathe as instructed. *Alternator.* The alternator is of the permanent-magnet type and has no commutator, brushes, etc. Examine the bearing and bearing liner of the alternator for evidence of overheating.
C	C		*Clean.* Blow dirt and dust out of the alternator with dry, compressed air.
*	*		173. *Controls, Switch Gear, Wiring.* *a. Circuit breakers.* See that the d-c and a-c circuit breakers are secured tightly to the instrument panel. Examine the condition of all connections. *b. Voltage Regulator.* See that the d-c voltage regulator is mounted securely and that all cable connections are clean and tight. Especially check the soldered cable connections to the small selenium rectifier on the regulator chassis.
C	C		*Clean.* Remove dust and dirt particles from the regulator with dry, compressed air. Wipe any accumulation of grease from the regulator. *c. Compensator Assembly.* Examine the condition of the transformer. Check for damaged insulation and bare wires. See that the transformer is mounted securely.

46. DA AGO Form 464 Services (contd)

TI	M	W	Action
			Check all connections from the transformer to the capacitor network, making sure they are all clean and tight.
C	C		*Clean.* Remove dust and dirt from the transformer and capacitor network with dry, compressed air.
			d. Wye-Delta Change Board. See that all the cable connections on the change board are clean and tight. Check for shorts.
*	*		*174. Drive Coupling.* Examine the engine-to-alternator drive coupling installation. Make sure that the bolts are tight and that the lockwires are in good condition.
*	*	*	*175. Temperatures.* (Enter this item on DA AGO Form 464.) With the unit in operation, feel the top of the alternator stator housing to determine any evidence of overheating. The housing should not be too hot to touch. Also test the housing around the rotor bearing for overheating.
			WINTERIZATION SYSTEM
			(Enter this item on DA AGO Form 464.)
*	*		*211. General.* (Enter this item on DA AGO Form 464.) Examine the condition of all metal tubes and hoses. See that all connections are tight. Check the condition of all the wiring for worn insulation and loose connections. Examine the heater controls for proper mounting. Operate the winterization system at least once a month.
*			*212. Heater.* (Enter this item on DA AGO Form 464.) Examine the combustion area and exhaust passages by removing the burner assembly (par. 54*k*(1)). Inspect the primary air holes in the top section of the burner. If the holes are plugged, clean them with a piece of wire. Examine the heat exchanger and exhaust outlet with a flashlight and an inspection mirror. If uniform carbon deposits on surfaces visible with the mirror exceed 1/8 inch in thickness, clean all tubing and heat exchanger parts. Check the exchanger for cracks. Inspect the burner wick for wear and deterioration. Replace the wick if it is charred or burned to a point 1/4-inch below the top edge of the igniter tube. See that the insulation on the electrode is not cracked or damaged.
C	C		*213. Heater Fuel Pump.* (Enter this item on DA AGO Form 464.) Refer to paragraph 36*b*(9) and clean the pump subassembly as instructed.
*			*214. Final Test.* (Enter this item on DA AGO Form 464.) After the unit has been checked completely, perform a final test in accordance with instructions given in paragraphs 23, 24, and 25.

Section IV. THEORY AND TROUBLE SHOOTING

47. Theory of Operation of Gasoline Engine Generator Set PU-107/U

a. ENGINE (fig. 17). The internal-combustion, four-stroke-cycle engine is of the conventional automotive type. Four-stroke cycle means that there are four strokes of the piston, two up and two down, to each operating cycle. Only every fourth stroke of the piston is a power stroke. A complete cycle of one piston, with the individual operation of each stroke, is described in the following subparagraphs.

(1) *Intake stroke.* A correctly metered, highly combustible mixture of air and gasoline is drawn from the carburetor through the intake manifold and intake valve port. The mixture is drawn into the cylinder as the piston travels downward, and the intake valve for that cylinder is open. The intake valve opens 9° before top dead center.

(2) *Compression stroke.* As the piston travels past bottom dead center, the intake valve closes (50° past bottom dead center) and the exhaust valve remains

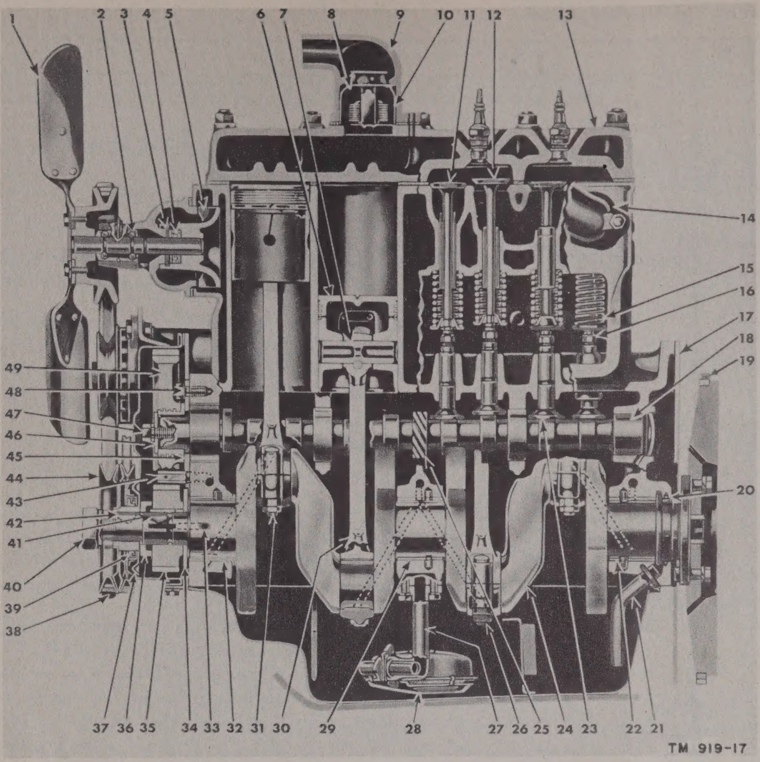


Figure 17. Engine, cross section, side view.

closed. The fuel-air mixture then is compressed between the piston and the cylinder head. As the piston reaches the top of the stroke, the spark plug emits a spark and ignites the highly compressed fuel mixture.

(3) *Power stroke.* The rapidly expanding gases, resulting from the burning fuel mixture, force the piston downward. This movement is transmitted through the connecting rod to the crankshaft, which converts the reciprocating motion to rotary motion.

(4) *Exhaust stroke.* The exhaust valve, as is the intake valve, is operated by a tappet in contact with the camshaft. The exhaust valve opens 47° before bottom dead center and permits the upward travel of the piston to expel the exhaust gases through the exhaust port in the engine, into the exhaust manifold, and then into the muffler. As the piston approaches top dead center, the intake valve again starts to open, the exhaust valve starts to close, and a new cycle is under way.

b. ENGINE SPEED GOVERNOR (fig. 22). The engine speed governor is of the flyweight type, belt-driven from a pulley on the engine crankshaft. The centrifugal force of the revolving flyweights is transmuted by a pivoted yoke to lateral motion which acts against the tension of the governor spring. This action also moves the carburetor throttle towards closed position. When the predetermined speed setting is reached, the governor speed remains constant. The governor maintains the engine speed at 1,714 rpm which is the synchronous speed for 400-cycle operation. Governor adjustments are described in paragraph 25*b*. The engine lubrication system supplies engine oil to the governor for continuous lubrication.

c. ENGINE OVERSPEED SAFETY GOVERNOR (fig. 24). The velocity-type overspeed safety governor is installed between the carburetor and intake manifold specifically to guard against engine damage due to failure of the engine speed governor or its drive belt. In normal operation, a spring within the governor holds the governor throttle plate open. If the engine starts to run-away, the velocity of the fuel mixture from the carburetor proceeds

LEGEND FOR FIGURE 17

1. Fan (O-140).
2. Water pump bearing and shaft assembly.
3. Water pump seal washer (H279).
4. Water pump seal assembly (H280).
5. Water pump impeller (O-79).
6. Piston.
7. Wrist pin.
8. Thermostat (O-1).
9. Water outlet elbow (H4).
10. Thermostat retainer (H6).
11. Exhaust valve (O-7 through O-10).
12. Intake valve (O-3 through O-6).
13. Cylinder head (A2)
14. Exhaust manifold (A10).
15. Valve spring (O-19 through O-26).
16. Valve tappet self-locking adjusting screw.
17. Rear engine plate (A8).
18. Camshaft (O-44).
19. Flywheel ring gear (O-72).
20. Rear end crankshaft packing (H51, H52).
21. Crankshaft bearing rear drain pipe.
22. Lower rear crankshaft bearing (O-65).
23. Valve tappet (O-35 through O-42).
24. Crankshaft (O-68).
25. Oil pump and distributor driven gear.
26. Connecting rod cap bolt (H88 through H95).
27. Oil float support (H158).
28. Oil float assembly (O-69).
29. Lower center crankshaft bearing (O-64).
30. Connecting rod assembly.
31. Connecting rod bolt locknut (H113 through H120)
32. Lower front crankshaft bearing (O-59).
33. Crankshaft oil passages.
34. Crankshaft thrust washer (H104).
35. Crankshaft gear (O-67).
36. Crankshaft gear spacer (H103).
37. Timing gear cover (A6).
38. Fan and generator drive belt (H480).
39. Crankshaft oil seal (H192).
40. Crankshaft nut (H174).
41. Crankshaft gear key (H101).
42. Fan and governor drive pulley key (H160).
43. Timing gear oil jet (O-2).
44. Fan, generator, and governor drive pulley (O-70).
45. Camshaft thrust plate (H77).
46. Camshaft gear retaining washer (H70).
47. Camshaft gear retaining screw (H71).
48. Camshaft gear thrust plate retaining screw (H73, H74).
49. Camshaft gear (O-45).

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to close the governor throttle plate as far as the tension of the governor spring will permit. This spring tension is set and sealed at the factory for approximately 2,100 rpm. To check and adjust the overspeed governor, refer to paragraphs 46 and 62*e* and proceed as instructed.

d. D-C SYSTEM (fig. 63). The 28-volt d-c system consists of two main components: a self-excited, belt-driven generator (fig. 28) and an aircraft-type, carbon-pile voltage regulator (fig. 35). The generator develops 2.5 kw at 28 volts, operating at a shaft speed of 4,550 rpm (engine speed of 1,714 rpm). The voltage regulator provides a means for maintaining an almost constant output voltage under all normal load conditions. Voltage regulation is obtained by automatically controlling the field current. Output voltage is controlled within a 4 percent change in engine speed; from no load to full load, the regulator maintains 28 volts, plus or minus 2 volts. The control is accomplished by a resistor in the external shunt-field circuit of the generator and by use of a variable resistor in the voltage regulator. The variable resistor controls the resistance so that a constant voltage is obtained at the output terminals and at any point within the electrical load and speed range of the generator. The variable resistor is adjustable to set the output from 25 to 30 volts.

e. COOLING SYSTEM (fig. 18). The engine coolant is circulated upward through the jacketed passages around the cylinders, valve ports, and combustion chambers. It then flows from the cylinder head through the top of the radiator, downward through the radiator, where it is cooled by the air blast of the fan. The coolant is then pumped back into and through the cylinder block. The system maintains the temperature of the coolant (measured at the engine outlet elbow) at least 10° F below the boiling point for water at the system pressure when operating under full load in ambient temperature up to 125° F. A 180° F thermostat allows the coolant to bypass through the radiator and circulate just within the engine until normal operating temperature has been attained. The high temperature cutoff switch mounted on the outlet elbow automatically opens the ignition circuit if the coolant temperature reaches the predetermined setting. The pressure in the system must exceed 4 pounds before the pressure cap will release vapor through the radiator overflow.

f. FUEL SYSTEM. The unit operates on fuel pumped from an external supply tank through the auxiliary fuel line. The fuel enters a disk-type filter and is pumped to the carburetor by a diaphragm-type pump (fig. 25). The diaphragm is actuated by the engine camshaft through a rocker arm (13) on the fuel pump. The rocker arm pulls

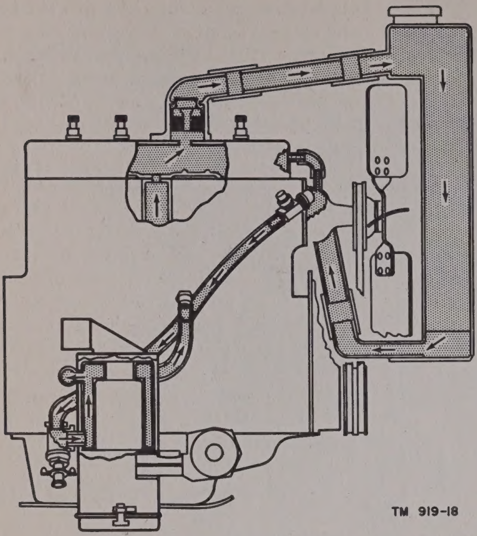

Figure 18. Cooling system flow diagram.

the diaphragm (16) downward; this reduces the pressure within the pump chamber and creates a suction on the inlet. Fuel flows upward to the sediment bowl (2), through the strainer screen (4) and inlet check valve (10), into the pump chamber. On the discharge stroke, the diaphragm spring (18) pressure pushes diaphragm upward, forcing fuel from the pump chamber, through the outlet check valve (9) and into the carburetor float bowl. The diaphragm is pulled downward by the camshaft and rocker arm and upward by the spring pressure until the carburetor bowl becomes full. The back pressure of fuel in the pump holds the diaphragm down, and it remains in this position until the lack of fuel in the carburetor float chamber permits operation of the pump. The fuel enters the carburetor bowl (1, fig. 19) through the float-operated needle valve assembly (2); the quantity of fuel is governed by the float (3). At idling speeds and light-load operation, fuel flows through the idle well jet (4) and the low-speed jet (5), where it combines with air entering through the bypass (6). The fuel breaks up into a vapor and continues on through the economizer (7) and is combined with more air from the lower bleed (8). The mixture is richer than required, but with air from the venturi (9) a suitable mixture for the engine is obtained. At rated full-load speeds, the velocity of air flowing through the carburetor venturi creates pressure at the tip of the main nozzle (10). The pressure causes fuel to flow from the bowl through the metering jet (11) and out of the main nozzle into the carburetor venturi. At high speeds, the area of the opening between the metering rod (12) and its jet governs the amount of fuel entering the engine. The metering rod is controlled by the throttle.

g. STARTING SYSTEM (fig. 20).

(1) *Automatic starting.* With the ignition switch in the REMOTE START position and the START—STOP switch in the START position, the ignition circuit is energized. At the same time, the coil of the start relay K1 is energized through the normally closed contacts of the battery-charging relay K3 and the closed contact of the oil pressure cutoff switch to ground. Relay K1 immediately pulls in and one set of contacts closes, thus energizing the starting motor circuit. The shunt coil and series coil of the starting solenoid become energized, and the series coil draws the pinion into engagement with the flywheel ring gear. When the pinion becomes completely engaged, the main contact on the starter closes, shorts out the series coil, and energizes the starting motor, which cranks the engine. During the cranking time, the pinion is held in position by the shunt coil. At the same time the solenoid is energized, the automatic choke becomes energized. A second set of contacts on relay K1, in parallel with the oil pressure cutoff switch, is also closed. This circuit enables the starting motor to continue cranking the engine after the oil pressure cutoff switch has opened because of cranking oil pressure. If the START—STOP switch is released at this point, the pinion disengages and will not re-engage the ring gear until the oil pressure cutoff switch closes (oil pressure drops below 5 psi). As the engine starts, the overriding clutch between the pinion and starter shaft prevents starter damage due to overspeed. When the engine speed reaches approximately 1,000 rpm, the d-c output of the battery charger (rectifier) reaches a sufficient value to actuate relay K3. (The START—STOP switch must be held in the START position during the entire cranking cycle.) Simultaneously, when K3 relay closes, K1 relay opens, and the hold relay (K2) closes. As K1 relay opens, the cranking circuit opens and the pinion is pulled back in release position by spring pressure on the starting solenoid armature. As K2 relay closes, the ignition circuit and K2 relay seals in. The START—STOP switch now may be released.

(2) *Manual starting.* With the ignition switch in the MANUAL START position and the engine being hand cranked, current is supplied direct from the batteries to the ignition circuit, bypassing all the relays and the protective circuits. In order to have the battery-charging and safety circuits function properly while the engine is running, the ignition switch must be returned to the REMOTE START position, and the START—STOP switch must be pressed momentarily in the START position. This sets the relays in run position. At this point, also, the unit can be run without the batteries, if necessary.

(3) *Stopping.* With the ignition switch in the REMOTE START position, momentarily depress the START—STOP switch in the STOP position. This will short-out the coil of relay K2 and cause its contacts to return to their normally open position. One set of contacts will open the ignition circuit and the second set of contacts will open the battery-charging circuit, thus stopping the unit. As the engine slows down, the battery-charging voltage decreases and relay K3 returns to its normal position. The oil pressure cutoff switch closes after the engine has completely stopped.

(4) *Coolant temperature and oil pressure cutoff switches.* In the event that either the coolant temperature exceeds the setting on the switch dial or the oil pressure falls below 5 psi, plus or minus 1 pound, the respective switches will function and short-out the coil on relay K2. This will open the contacts of the relays, thus opening the ignition and battery-charging circuits, and cause the unit to stop. The unit then will not operate in the REMOTE START position until the cause of the failure is corrected. The unit will, however, run in MANUAL START position, because the safety switches are not in the manual start circuit.

b. LUBRICATION SYSTEM. The gear-type rotary oil pump is located externally on the right side of the engine. The pump is driven by a spiral gear on the engine camshaft and draws oil from the crankcase through a floating oil intake. The float and screen assembly is so constructed that it remains on top of the oil, raising and lowering with the oil level. The oil, therefore, is drawn from the top surface, leaving any accumulation of water and dirt in the bottom of the pan. Oil is forced to the crankshaft and the camshaft bearings through drilled

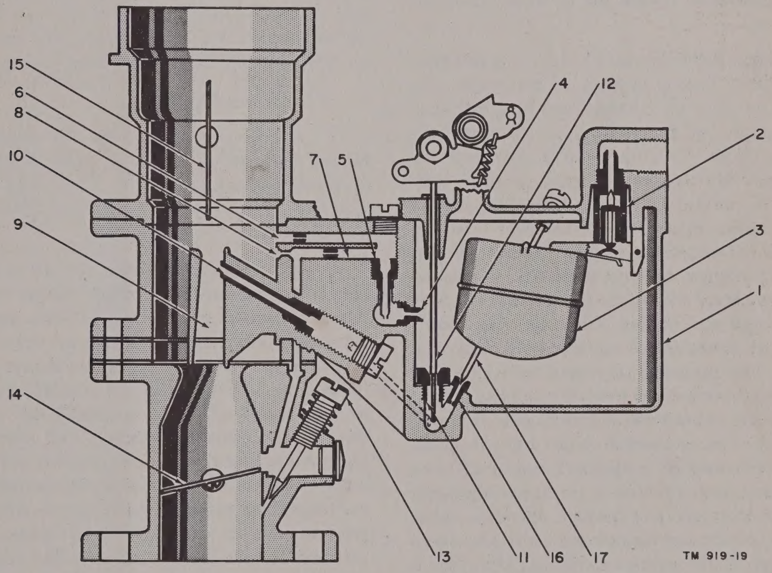

Figure 19. Carburetor functional diagram.

1. Bowl.
2. Needle valve assembly.
3. Float.
4. Idle well jet.
5. Low-speed jet.
6. Bypass.
7. Economizer.
8. Lower bleed.
9. Venturi.
10. Main nozzle.
11. Metering jet.
12. Metering rod.
13. Idle adjustment screw.
14. Throttle valve.
15. Choke valve.
16. Altitude jet.
17. Altitude adjusting needle.

passages in the cylinder block webs and then to the connecting rod bearings through drilled passages in the crankshaft. A drilled passage in the crankshaft, from the front bearing to holes in the crankshaft sprocket, provides positive lubrication for the timing gears through a jet. Direct spray from the connecting rod bearings lubricates the cylinder walls, pistons, piston pins, and the valve mechanism. The oil is forced through the disk-type oil filter from the outlet line on the right side of the crankcase. The oil enters the filter bowl and passes through a stack of disks and spacers to the outlet. Dirt and solids lodge against the disks and the clean oil passes through. At the filter outlet the oil is diverted in two directions. A small portion travels through the engine speed governor, into the valve spring cover and back to the crankcase. The remaining oil, leaving the filter, is conducted to the timing gear cover and then down to the crankcase. If the oil pressure drops below a safe minimum of 5 psi, plus or minus 1 pound, the low oil pressure cutoff switch opens the ignition circuit and stops the engine.

i. ALTERNATOR. Generator set PU-107/U is equipped with an alternator directly coupled to the engine flywheel and supported at the outboard end by a ball bearing. The alternator is of the rotating permanent-magnet-field type with 28 poles, resulting in a frequency of 400 cycles per second with an engine speed of 1,714 rpm. The alternator is rated at 12.5 kw and generates 120 or 208 volts, depending on the connection used. The specific feature of the permanent-magnet alternator is that it has no field windings; therefore it requires no external excitation. This feature eliminates the conventional commutator, slip rings, and brushes. The rotor constitutes a cage structure of nonmagnetic stainless steel disks with rivets holding the magnets, laminated pole tips, and inner magnetic tie laminations accurately in place around the drive hub. The entire mass is centrifugally cast with aluminum alloy. The aluminum body fills all voids, making the entire assembly a rigid and solid metal unit. It gives ideal damping action as it forms low-resistance circuits around each pole and through openings in the pole tips. Fan blades are formed with the aluminum casting and give all the necessary cooling. The rotor is magnetized with the poles having alternate north and south polarity around the circumference. The magnetic flux (fig. 21) leaves each north pole of the rotating field, passes through the iron core of the stator, and then returns to the adjacent south poles of the rotating field. The rotor with its magnetic field sweeps across the stator windings. There are three separate coils wound on the stator, 120 electrical degrees apart. As the lines of flux cut the stator conductors, voltages are induced in each separate stator winding, producing three-phase alternating voltage. The inherent voltage regulation varies from very close regulation for unity power factor loads to very poor regulation for highly lagging power factor loads. Leading power factor loads increase the voltage so that close voltage regulation can be obtained on single- or three-phase loading when each load is power-factor corrected with parallel capacitance. The compensator assembly will increase the voltage of low power-factor loads but cannot completely correct for unity power-factor voltage drop. The compensator assembly consists of a series current transformer and a network of six capacitors connected two in parallel across each transformer secondary. The primary windings of the transformer are connected in series with the respective stator windings. This assembly provides a static means of voltage regulation.

j. WINTERIZATION SYSTEM. Incorporated within the unit is a winterization system designed to preheat the engine crankcase oil, coolant, and intake manifold for ease in starting in arctic conditions. The gasoline-burning, semiautomatic heater has an input capacity of 32,000 Btu (British thermal unit) per hour on *high fire* and 14,000 Btu per hour on *low fire.* The heater will start quickly under all temperature conditions to −65° F.

(1) *Air system.*

(*a*) *Blower and motor.* A paddle-wheel-type blower mounted to a 12-volt motor supplies both the combustion air and the air for diluting the burned gases. The blower motor must turn at least 5,000 rpm to provide satisfactory combustion.

(*b*) *Burner and throat.* The air delivered by the blower is conducted to the heater burner bowl and combustion chamber through an air box and gallery. It enters the burner bowl through the primary air holes. From the primary air holes in the burner bowl, the air mixes with fuel vapor, but the mixture remains too rich to burn until sufficient secondary air is introduced through the throat opening, where combustion takes place. Air is added to the exhaust gases through the relief holes in the throat. This additional air aids combustion, but its primary purpose is to lower the exhaust gas temperatures and to provide a larger volume of warm air (contaminated with exhaust gas) for external heating of the oil pan and intake manifold.

(2) *Fuel system.*

(*a*) *Pump.* The heater fuel pump supplies fuel under pressure to a two-stage fuel control valve. This is accomplished by a solenoid which, when energized, activates a hollow plunger. The stroke of the plunger is controlled by a set of interrupter points (sealed in helium) in the electrical circuit and a calibrated plunger spring. The pump is self-priming and requires no bleeding or adjustment. The pump provides fuel when the heater RUN—START switch is held in START position and also when it is thrown to the RUN position after

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(1) *Air system.*

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(*b*) *Burner and throat.* The air delivered by the blower is conducted to the heater burner bowl and combustion chamber through an air box and gallery. It enters the burner bowl through the primary air holes. From the primary air holes in the burner bowl, the air mixes with fuel vapor, but the mixture remains too rich to burn until sufficient secondary air is introduced through the throat opening, where combustion takes place. Air is added to the exhaust gases through the relief holes in the throat. This additional air aids combustion, but its primary purpose is to lower the exhaust gas temperatures and to provide a larger volume of warm air (contaminated with exhaust gas) for external heating of the oil pan and intake manifold.

(2) *Fuel system.*

(*a*) *Pump.* The heater fuel pump supplies fuel under pressure to a two-stage fuel control valve. This is accomplished by a solenoid which, when energized, activates a hollow plunger. The stroke of the plunger is controlled by a set of interrupter points (sealed in helium) in the electrical circuit and a calibrated plunger spring. The pump is self-priming and requires no bleeding or adjustment. The pump provides fuel when the heater RUN—START switch is held in START position and also when it is thrown to the RUN position after

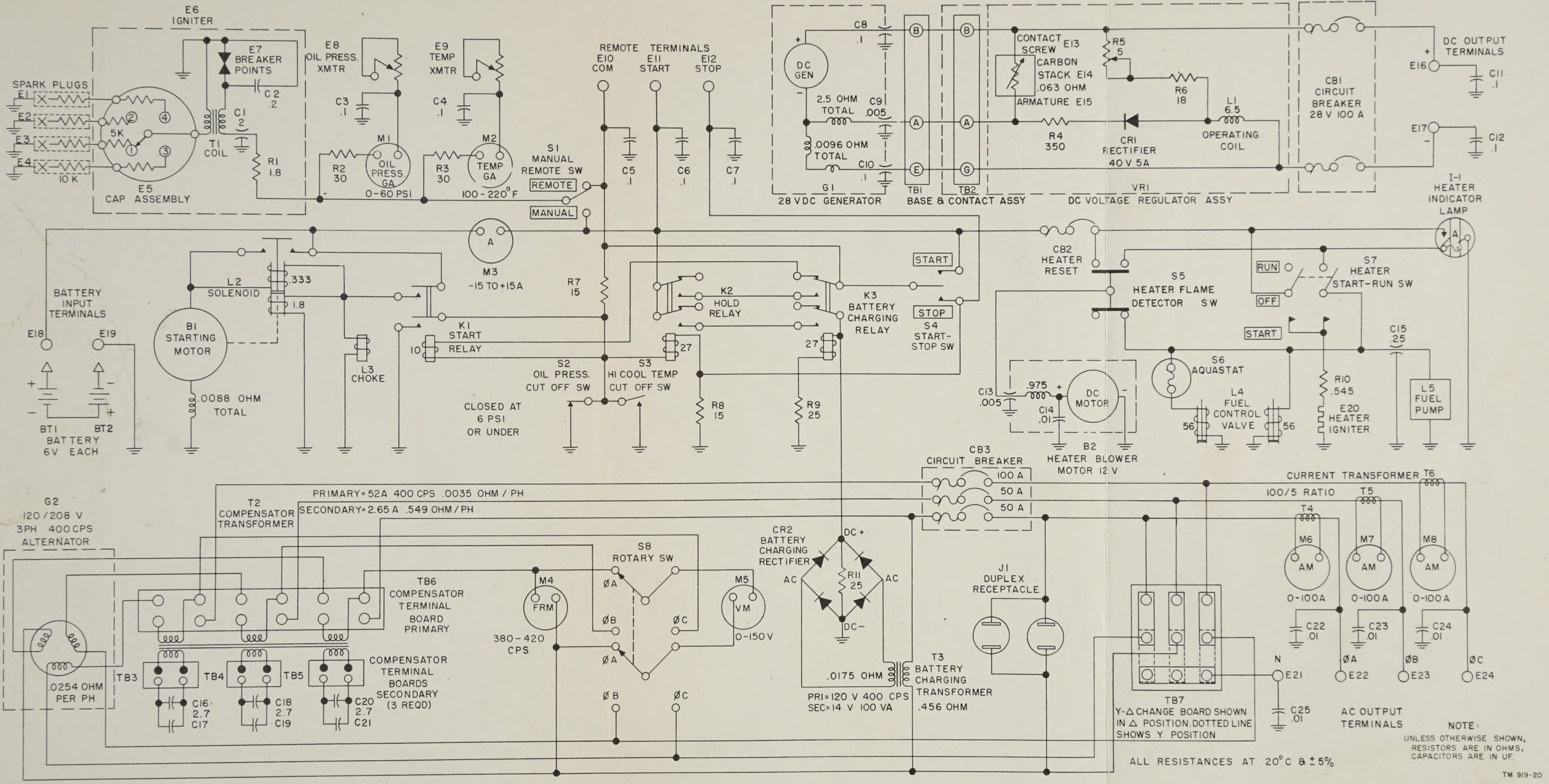
E6
IGNITER
E7
BREAKER
POINTS
C2
.2
C1
.2
T1
COIL
R1
1.8
SPARK PLUGS
E1
E2
E3
E4
5K
10 K
E5
CAP ASSEMBLY
E8
OIL PRESS.
XMTR
C3
.1
M1
OIL
PRESS.
GA
0-60 PSI
R2
30
E9
TEMP
XMTR
C4
.1
M2
TEMP
GA
100 - 220° F
R3
30
S1
MANUAL
REMOTE SW
REMOTE
MANUAL
REMOTE TERMINALS
E10
COM
E11
START
E12
STOP
C5
.1
C6
.1
C7
.1
DC
GEN
C8
.1
C9
.005
C10
.1
2.5 OHM
TOTAL
.0096 OHM
TOTAL
G1
28 VDC GENERATOR
TB1
TB2
BASE & CONTACT ASSY
CONTACT
SCREW
E13
CARBON
STACK E14
.063 OHM
ARMATURE E15
R5
5
R6
18
R4
350
CR1
RECTIFIER
40 V 5A
L1
6.5
OPERATING
COIL
VR1
DC VOLTAGE REGULATOR ASSY
CB1
CIRCUIT
BREAKER
28 V 100 A
DC OUTPUT
TERMINALS
E16
E17
C11
.1
C12
.1
I-1
HEATER
INDICATOR
LAMP
BATTERY
INPUT
TERMINALS
E18
E19
BT1
BT2
BATTERY
6V EACH
L2
SOLENOID
.333
1.8
B1
STARTING
MOTOR
.0088 OHM
TOTAL
L3
CHOKE
M3
-15 TO +15 A
K1
START
RELAY
10
R7
15
K2
HOLD
RELAY
27
K3
BATTERY
CHARGING
RELAY
27
START
STOP
S4
START-
STOP SW
S2
OIL PRESS.
CUT OFF SW
S3
HI COOL TEMP
CUT OFF SW
CLOSED AT
6 PSI
OR UNDER
R8
15
R9
25
CB2
HEATER
RESET
S5
HEATER FLAME
DETECTOR SW
RUN
OFF
S7
HEATER
START-RUN SW
START
C15
.25
C13
.005
.975
C14
.01
DC
MOTOR
B2
HEATER BLOWER
MOTOR 12 V
S6
AQUASTAT
L4
FUEL
CONTROL
VALVE
56
56
R10
.545
E20
HEATER
IGNITER
L5
FUEL
PUMP
CB3
CIRCUIT BREAKER
100 A
50 A
50 A
CURRENT TRANSFORMER
100/5 RATIO
T4
T5
T6
M6
AM
0-100 A
M7
AM
0-100 A
M8
AM
0-100 A
C22
.01
C23
.01
C24
.01
N
ØA
ØB
ØC
E21
E22
E23
E24
C25
.01
AC OUTPUT
TERMINALS
G2
120/208 V
3PH 400 CPS
ALTERNATOR
.0254 OHM
PER PH
T2
COMPENSATOR
TRANSFORMER
PRIMARY = 52A 400 CPS .0035 OHM / PH
SECONDARY = 2.65 A .549 OHM / PH
TB6
COMPENSATOR
TERMINAL
BOARD
PRIMARY
TB3
TB4
TB5
C16
2.7
C17
C18
2.7
C19
C20
2.7
C21
COMPENSATOR
TERMINAL
BOARDS
SECONDARY
(3 REQD)
M4
FRM
380 - 420
CPS
S8
ROTARY SW
ØA
ØB
ØC
ØA
ØB
ØC
M5
VM
0-150 V
CR2
BATTERY
CHARGING
RECTIFIER
DC +
DC -
AC
AC
R11
25
.0175 OHM
T3
BATTERY
CHARGING
TRANSFORMER
.456 OHM
PRI = 120 V 400 CPS
SEC = 14 V 100 VA
J1
DUPLEX
RECEPTACLE
TB7
Y-Δ CHANGE BOARD SHOWN
IN Δ POSITION, DOTTED LINE
SHOWS Y POSITION
ALL RESISTANCES AT 20°C & ± 5%
NOTE:
UNLESS OTHERWISE SHOWN,
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UF.
TM 919-20

Figure 20. Schematic wiring diagram.

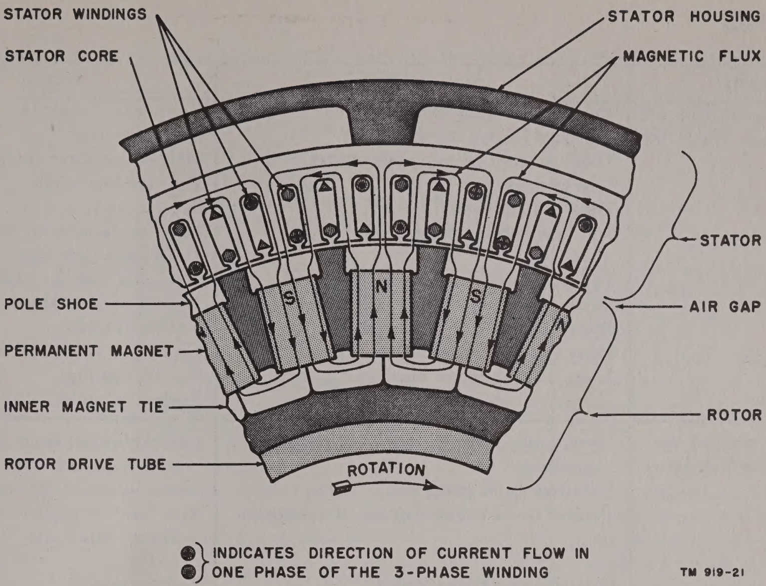

Figure 21. Alternator theory.

the heater is ignited. The pump will not operate if the RUN—START switch is moved to the RUN position under any of the following conditions: before the ignition is completed, as shown by the flashing on of the heater OPERATING indicator lamp; during the purging cycle of the heater; and accidentally when the heater is not being operated. The pump is not affected by operation of the thermostat and will operate continuously whenever the heater is in use.

(*b*) *Fuel control valve.* The electrically operated fuel control valve consists essentially of a pressure regulator and two independent, solenoid-operated valves which control the flow of fuel to the heater through orifices. Both solenoid valves are normally closed (when the coils are not energized). The shut-off valve allows fuel to flow only when the coil is energized; the high-low valve is connected into the circuit with the heater thermostat. When the coil is not energized, fuel is forced to flow through a restricted orifice calibrated for *low fire* operation. When the high-low valve is energized, the valve is opened and fuel passes through a bypass calibrated for *high fire* operation.

(3) *Electrical system.*

(*a*) *Control panel.* Heater components of the control panel include a RUN—START switch, a heater OPERATING indicator lamp, and the circuit breaker RESET switch. These components are discussed and the instructions for their operation are covered in paragraph 18*c*.

(*b*) *Flame switch.* The flame switch controls the electrical supply to the pump, control valve, indicator lamp, and blower motor. This switch is actuated by the presence of flame in the heater combustion chamber. The flame switch consists of a quartz rod encased in a metal tube with an integral mounting bracket which supports a microswitch and adjusting spring. The quartz rod and tube extend into the top of the heater where they are subjected to the flame. The heat causes the tube to expand and permits the quartz rod to release the microswitch button.

48. Meaning of Trouble Shooting

The primary function of trouble shooting is to locate and correct the causes of faulty operation and equipment failure. All mechanical equipment is subject to occasional failure. Whenever difficulty with the equipment is experienced, the operator or repair man must be able to locate and correct the cause as quickly as possible. The trouble charts (par. 49) indicate various difficulties that are likely to be experienced, symptoms which indicate that trouble exists, the possible cause, and suggested remedy. Reference to various illustrations and diagrams in this instruction book will aid in localizing the trouble.

49. Trouble Chart

a. ENGINE.

Symptom	Possible cause	Remedy
1. Starting motor will not crank engine; cranks too slowly.	Discharged battery or shorted cell.	Recharge or replace battery.
	Corroded battery terminals.	Clean terminals.
	Loose or dirty battery cable connections.	Tighten and clean connections.
	Engine stuck.	Try with hand crank.
	Defective start relay.	Replace relay.
	Too heavy oil in crankcase.	Refer to lubrication chart. Drain and refill with lighter oil.
	Engine ground strap connections loose.	Clean and tighten connections.
	Wire connections loose at starting motor.	Tighten connections.
	Worn starting motor brushes.	Replace brushes.
	Dirty starting motor commutator.	Clean with #0000 sandpaper.
	Worn starting motor bearings.	Replace bearings.
	Burned start solenoid contacts.	Replace solenoid.
2. Engine is cranked electrically, but will not start.	Battery too weak to supply ignition while cranking.	Start with hand crank. Recharge or replace battery.
	Defective spark plugs.	Clean, adjust, or replace (par. 46).
	Breaker contacts pitted or out of adjustment.	Resurface or replace contacts and adjust gap (par. 54*b*(2) and (3)).
	Corroded start relay contacts.	Replace relay.
	Empty fuel supply tank.	Refill.
	Clogged or frozen fuel line.	Disconnect and clean (par. 27*a*).
	Dirty fuel filter.	Clean (par. 36*b*(4)).
	Clogged fuel pump strainer screen.	Clean (par. 36*b*(5)).
	Defective electric choke.	Use manual choke. Replace.
	Cylinders flooded.	Crank with spark plugs removed. Replace carburetor needle valve.
	Poor fuel.	Drain, refill with correct grade of fuel.
	Dirt in carburetor.	Clean.
	Low compression.	Refer to symptom 21 below.
	Incorrect ignition timing.	Retime (par. 61*i*).
	No ignition current or weak ignition current.	Clean and tighten ignition circuit connections. Clean, adjust, or replace spark plugs (par. 46). Resurface, adjust, or replace breaker contacts (par. 54*b*(2) and (3)). Replace defective ignition capacitor or coil.
	Distributor cap or rotor cracked, burned, or carbonized.	Replace defective part.
	Leaking fuel line connections.	Tighten.
	Fuel pump sediment bowl loose.	Tighten thumbnut.
	Carburetor inlet valve stuck.	Replace needle valve assembly.
	Engine ground strap loose or dirty.	Clean or tighten.
3. Low oil pressure.	Oil too light or badly diluted.	Drain and refill with oil of correct grade and weight. Refer to lubrication chart.
	Oil too low.	Add oil. Refer to lubrication chart.
	Oil pressure relief valve not seating.	Remove and clean.

a. ENGINE (contd).

Symptom	Possible cause	Remedy
	Worn crankshaft bearings.	Replace bearings.
	Sludge on oil float screen.	Remove and clean.
	Worn oil pump.	Replace.
	Defective oil gage.	Replace.
	Oil pressure relief valve out of adjustment.	Add shims (par. 25*b*(6)).
	Air leak between oil float support and crankcase.	Replace gasket.
4. High oil pressure.	Oil too heavy.	Drain and refill with oil of correct grade and weight. Refer to lubrication chart.
	Clogged oil passage.	Drain oil and clean passage.
	Oil pressure relief valve stuck.	Remove and clean.
	Oil pressure relief valve out of adjustment.	Remove shims (par. 25*b*(6)).
	Defective oil gage.	Replace.
5. Excessive oil consumption, light blue smoky exhaust.	Poor compression.	Refer to symptom 21 below.
	Oil leaking from pan or connections.	Replace gaskets and leaking hoses. Tighten screws and connections.
	Oil too light or diluted.	Drain and refill with oil of correct grade and weight. Refer to lubrication chart.
	Bearing clearance too great.	Replace bearings.
	Too much oil in crankcase.	Drain excess oil.
	Excessive clearance between valve stems and guides.	Replace valves and guides.
	Faulty ignition.	Refer to symptom 2 above.
	Piston rings stuck in grooves, worn, or broken.	Replace piston rings.
	Piston rings improperly fitted or weak.	Replace piston rings.
	Piston ring oil return holes clogged.	Clean.
	Oil leaks at gaskets or seals.	Replace.
	Too much clearance between piston and cylinder bore.	Rebore and install oversized pistons.
	Misalined connecting rods.	Straighten or replace.
	Crankcase ventilator not operating.	Clean crankcase ventilating control valve (par. 46).
6. Engine stops unexpectedly.	Fuel tank empty.	Refill.
	Coolant temperature too high.	Refer to symptom 24 below.
	Coolant temperature cutoff switch set too low.	Adjust setting (par. 19*a*(3))
	Low oil pressure.	Refer to symptom 3 above.
	Disconnected wire.	Check ignition circuit.
7. Engine will not idle satisfactorily.	Crankcase ventilation control valve will not seat.	Replace valve.
	Carburetor out of adjustment.	Adjust (par. 25*b*(5) or 62*f*).
8. Engine misses.	Clogged carburetor jets.	Remove and clean.
	Fouled spark plugs.	Clean, adjust, or replace (par. 46).
	Carburetor idle valve rough or burred.	Replace.
	Intake manifold air leak.	Tighten or replace gaskets.
	Pitted or improperly adjusted ignition contacts.	Resurface, adjust, or replace contacts (par. 54*h*(2) and (3)).

a. ENGINE (contd).

Symptom	Possible cause	Remedy
	Defective ignition capacitor.	Replace capacitor.
	Faulty ignition coil.	Replace.
	Uneven compression.	Refer to symptom 21 below.
	Tappet adjustment too close.	Adjust (par. 62*c*).
	Defective ignition cable.	Replace.
	Sticking valves.	Grind valves.
	Weak or broken valve spring.	Replace spring.
	Faulty wiring.	Check ignition circuit.
	Water or dirt in fuel.	Drain and refill with clean fuel.
	Engine overheated.	Refer to symptom 24 below.
	Incorrect ignition timing.	Retime (par. 61*i*).
9. Engine will not take full load.	Carburetor-to-governor linkage too short.	Adjust (par. 25*b*).
	Incorrect valve timing.	Retime (par. 62*b*).
10. Engine hunting under load.	Carburetor-to-governor linkage too short.	Adjust (par. 25*b*).
	Governor spring eyebolt out of adjustment.	Adjust (par. 25*b*).
11. Engine hunting under no load.	Carburetor-to-governor linkage too short.	Adjust (par. 25*b*).
	Governor bumper screw out of adjustment.	Adjust (par. 25*b*).
	Governor spring eyebolt out of adjustment.	Adjust (par. 25*b*).
12. Engine backfires through carburetor.	Lean fuel mixture.	Adjust and clean carburetor. Clean fuel filter. Tighten or replace intake manifold gasket.
	Poor grade fuel.	Drain and refill with correct grade fuel.
	Spark too late.	Retime ignition (par. 61*i*).
	Distributor wires crossed.	Install wire correctly.
	Intake valves leaking.	Grind and reseat valves.
	Incorrect valve timing.	Retime (par. 62*b*).
13. Light pounding knock.	Loose connecting rod bearing.	Tighten connecting rod cap nuts or replace bearing.
	Low oil supply.	Add oil. Refer to lubrication chart.
	Low oil pressure.	Refer to symptom 3 above.
	Oil badly diluted.	Change oil. Refer to lubrication chart.
14. Dull metallic thud, increases with load.	Loose crankshaft bearings.	Tighten or replace bearings.
15. Sharp metallic thud in cold starting.	Low oil supply.	Add oil. Refer to lubrication chart.
	Low oil pressure.	Refer to symptom 3 above.
	Oil badly diluted.	Change oil. Refer to lubrication chart.
16. Pinging sound during rapid acceleration or overload.	Carbon in cylinders.	Remove carbon.
	Spark too early.	Retime ignition (par. 61*i*).
	Wrong spark plugs.	Replace with new plugs.
	Spark plugs burned or carboned.	Clean or install new plugs (par. 46).
	Valves hot.	Adjust tappets (par. 62*c*).
	Fuel stale or low octane.	Use correct grade fuel.
	Lean fuel mixture.	Adjust carburetor.

a. ENGINE (contd).

Symptom	Possible cause	Remedy
17. Clicking sound.	Tappet clearance too great.	Adjust tappets (par. 62*c*).
	Broken valve spring.	Install new spring.
18. Hollow clicking sound.	Loose pistons.	If noise is slight, and disappears after warm up, no immediate attention needed. If noise increases, replace piston pins.
19. Popping, spitting or detonation.	Incorrect ignition timing.	Retime (par. 61*i*).
	Improper carburetion.	Adjust and clean carburetor.
	Poor valve seating.	Grind valves and reseat.
	Sticking valves.	Refer to symptom 23 below.
	Broken valve spring.	Replace spring.
	Tappets adjusted too close.	Adjust tappets (par. 62*c*).
	Spark plug electrodes burned.	Replace spark plugs.
	Water or dirt in fuel.	Drain fuel.
	Clogged fuel lines.	Blow out lines.
	Improper valve timing.	Retime (par. 62*b*).
20. Engine lacks power.	Low compression.	Refer to symptom 21 below.
	Dirt in carburetor or fuel pump.	Clean.
	Dirty air cleaner.	Clean, refill to proper level. Refer to lubrication chart.
	Improper setting of air inlet gate on air cleaner.	Change setting (par. 16*a*).
	Choke inoperative.	Use manual choke. Replace electric choke.
	Carbon in cylinders.	Remove carbon.
	Restricted exhaust line.	Clean.
	Incorrect ignition or valve timing.	Retime (par. 61*i*).
	Carburetor flooded or dirty.	Clean carburetor.
	Engine overheated.	Refer to symptom 24 below.
	Fuel lines clogged.	Drain and clean.
	Improper tappet clearance.	Adjust (par. 62*c*).
	Sticking valves.	Grind and reseat valves.
	Piston rings broken or worn.	Replace rings.
21. Low or fluctuating engine compression.	Faulty cylinder head gasket.	Replace.
	Insufficient tappet clearance.	Adjust tappets (par. 62*c*).
	Improperly fitted pistons or piston rings.	Replace with correct fit.
	Valves not seating properly.	Grind and reseat valves.
	Valve spring weak or broken.	Replace spring.
	Burned valves.	Grind or replace valves.
22. Lack of vacuum.	Incorrect ignition timing.	Retime (par. 61*i*).
	Weak valve springs.	Replace springs.
	Worn valve guides.	Replace guides.
	Leakage of carburetor gasket, manifold gasket.	Replace gaskets.
	Poor carburetor adjustment.	Adjust carburetor (par. 25*b*(5) or 62*f*).
	Exhaust line clogged.	Clean.
	Burned valves.	Grind or replace valves.

a. ENGINE (contd).

Symptom	Possible cause	Remedy
23. Valves sticking.	Warped valve.	Replace.
	Improper tappet clearance.	Adjust (par. 62*c*).
	Carbonized or scored valve stems.	Buff or replace valve.
	Valve stem to guide clearance insufficient.	Replace valve and guide.
	Weak or broken valve spring.	Replace spring.
	Valve spring cocked.	Replace spring.
	Contaminated oil.	Drain and refill. Refer to lubrication chart.
24. Engine overheating.	Lack of proper lubrication.	Refer to lubrication chart.
	Stoppage of coolant circulation.	Check for sludge in radiator.
	Faulty thermostat.	Replace.
	Lack of coolant.	Refill. Refer to symptom 26 below.
	Slipping fan belt.	Tighten (par. 46).
	Incorrect ignition timing.	Retime (par. 61*i*).
	Clogged muffler.	Clean.
	Scored or ineffective piston rings.	Replace rings.
	Water pump inoperative.	Overhaul or replace.
25. Engine overcooling.	Thermostatic valve sticking open.	Replace.
	Climatic conditions.	Cover radiator to bring temperature to proper range.
26. Loss of coolant.	Loose hose connections.	Tighten.
	Damaged hose.	Replace.
	Leaking water pump.	Overhaul or replace.
	Leaking radiator.	Remove and repair.
	Leaking cylinder head gasket.	Replace.
	Crack in cylinder head or block.	Replace.
27. Poor fuel economy.	Ignition timing slow.	Retime (par. 61*i*).
	Carburetor float too high.	Adjust float by bending float lip.
	Fuel leakage.	Check lines. Tighten connections.
	Leaking fuel pump diaphragm.	Replace diaphragm or fuel pump.
	Low compression.	Refer to symptom 21 above.
	Valves sticking.	Grind and reseat.
	Fouled spark plugs.	Replace.
	Weak ignition coil or capacitor.	Replace.
	Improper valve tappet clearance.	Adjust tappets (par. 62*c*).
	Dirty air cleaner.	Clean and refill. Refer to lubrication chart.
	Clogged muffler.	Clean.
28. Bearing failure.	Crankshaft bearing journal out-of-round.	Regrind or replace shaft.
	Lack of oil.	Keep crankcase full.
	Oil leakage.	Replace leaking oil seals and gaskets
	Dirty oil.	Refer to lubrication chart.
	Low oil pressure.	Refer to symptom 3 above.
	Connecting rod bent.	Straighten or replace.
29. Rear main bearing leak.	Crankcase ventilating control valve clogged.	Clean.
	Packing worn or deteriorated.	Replace packing.

b. ALTERNATOR.

Symptom	Possible cause	Remedy
1. Abnormal frequency regulation.	Carburetor-to-governor linkage out of adjustment.	Adjust (par. 25*b*).
	Governor spring eyebolt out of adjustment.	Adjust (par. 25*b*).
2. Voltage too high.	Governor out of adjustment.	Adjust governor (par. 25*b*).
3. Low voltage.	Governor out of adjustment.	Adjust governor (par. 25*b*).
	Rotor has lost magnetism due to severe jolt, coming in contact with another rotor, or being allowed to roll on steel bench. *Note.* Loss of magnetism can occur only while rotor is out of unit.	Return rotor to factory for remagnetizing.
4. Low or no voltage on one phase with other phase abnormally high.	Short circuit across the particular phase.	Check stator with internal growler. Repair short circuit or replace stator.
5. No voltage reading in any one or all phases under no load.	Voltmeter circuit open.	Repair open circuit.

c. D-C GENERATOR.

Symptom	Possible cause	Remedy
1. Generator operating at rated rpm, but has low or no voltage.	Connections loose, dirty, or have high resistance.	Clean and tighten connections.
	Brushes binding in holders.	Remove brushes and clean with lint-free dry cloth.
	Brush spring tension too low.	Replace brush springs.
	Brushes worn.	Replace.
	Commutator rough, pitted, or eccentric.	Clean or resurface (par. 54*i*(2)).
	Armature winding short-circuited or grounded.	Replace armature.
	Generator field polarity reversed (magnetized in wrong direction).	Flash shunt field in proper direction as follows: Connect two #8 AWG or larger cables to a 24-volt battery. With engine operating at 1,714 rpm connect the negative lead of the battery to the negative terminal on the generator and momentarily touch the hot or positive lead to the positive terminal on the generator.
	Generator drive belt loose or slipping.	Tighten belt.
	Regulator armature spring weak or broken.	Replace armature assembly.
	Armature lead in regulator broken.	Repair lead or replace armature assembly.
	Regulator pile adjusting screw contact lead broken.	Repair adjusting screw lead assembly.
	Regulator adjusting screw not making contact with carbon stack.	Readjust regulator (par. 62*b*).
	Regulator carbons are pitted or burned.	Replace carbon stack and readjust regulator (par. 62*b*).
	Regulator core screwed in too far.	Readjust regulator (par. 62*b*).
	Regulator operating coil is shorted.	Repair or replace operating coil.

c. D-C GENERATOR (contd).

Symptom	Possible cause	Remedy
2. Voltage flutters.	Regulator stabilizing resistors or rectifier open. Regulator not properly adjusted.	Replace resistor or rectifier. Readjust regulator (par. 62*h*).
3. Generator operating at rated rpm, but voltage is too high.	Short circuit between the two cables to the regulator terminals "A" and "B." Regulator cannot be adjusted. Voltage regulator operating coil lead broken or unsoldered. Voltage regulator operating coil burned out. Fixed resistor on regulator (18 ohms) burned out or open. Regulator armature contact sticking in pile tube. Regulator core screwed out too far. "A" and "B" leads reversed at regulator base. Regulator voltage variable resistor is open or shorted. Dirty contact buttons and contact blades in regulator base.	Restore to correct condition. Replace voltage regulator. Resolder. Replace operating coil. Replace resistor. Disassemble and free armature. Readjust core (par. 62*h*). Check wiring. Replace resistor. Clean contact buttons and blades.
4. Excessive arcing present at generator brushes.	Brushes worn too short to be held against commutator. Brushes binding in their holders. Brush spring tension too low. Rough or burned commutator. Rough, burned, pitted, or eccentric commutator. High voltage. Wrong connections between generator and switch relay.	Replace brushes. Remove brushes and clean with lint-free dry cloth. Replace the brush springs. Clean and polish with #0000 sandpaper. Resurface. Check voltage regulator adjustment. Check and correct according to wiring diagram (fig. 63).
5. Generator commutator throwing solder.	Excessive arcing at generator brushes.	Refer to symptom 4 above.
6. Field current cannot be adjusted within the specified limits.	Faulty wiring connections. Field circuit is either open-circuited, short-circuited, or field resistance incorrect. Brushes not seating properly.	Clean and tighten all connections, replace defective wires or connections. Replace the field ring assembly. Check and apply remedies given.
7. Generator overheats.	Brushes improperly seated. Armature is short-circuited. Bearings tight. Commutator bars high or out of alignment.	Reseat. Replace armature. Replace bearings. Replace the armature assembly if the commutator bars are out of alinement; turn down the bars on a lathe if they are too high.

d. WINTERIZATION SYSTEM.

Symptom	Possible cause	Remedy
1. Failure to ignite.	Circuit breaker (RESET) open. Burned out electrode. Burned out resistor. Fuel pump inoperative. Fuel control valve failure. Flame switch failure.	Press in and check the indicator lamp. Replace electrode. Replace resistor. Refer to symptom 2 below. Replace control valve inlet screen; blow off orifice plate. Replace flame switch.
2. Fuel pump inoperative.	Loose or dirty ground connections. Loose electrical wires and connections. Incorrect reassembly of parts. Interrupter system not functioning properly.	Clean and tighten. Check and tighten. Disassemble and reassemble correctly. Replace pump.
3. Pump operates, but fails to deliver fuel.	Air leak in fuel line or at connections. Restrictions in fuel line. Distorted or damaged gasket.	Replace defective tubing; tighten connections. Remove and clean. Replace gasket.
4. Failure to keep running.	Flame switch control failure. Blower motor failure or slow down. Poor electrical connection. Plugged exhaust line. Coolant leak in burner. Dirty control valve filter. Plugged feed line to burner. Fuel pump inoperative. Burned, charred, or worn wick.	Check and replace. Test and replace. Check for continuity of circuits. Disconnect and clean. Check and replace leaking part. Replace control valve inlet screen; blow off orifice plate. Remove and clean. Refer to symptom 2 above. Replace wick.
5. Failure to shut off.	Flame switch failure.	Remove and replace.

e. RADIO FREQUENCY SUPPRESSION EQUIPMENT.

Symptom	Possible cause	Remedy
Unsatisfactory suppression of radio frequencies.	Loose ground straps, external-internal toothed lockwashers, or capacitor connections. Defective capacitor.	Tighten. Replace.

CHAPTER 4

FIELD MAINTENANCE INSTRUCTIONS

Section I. GENERAL

50. Scope

This chapter covers the complete repair and overhaul instructions for Gasoline Engine Generator Set PU-107/U and is written specifically for personnel in charge of field and depot maintenance and repair. The instructions include detailed steps to be followed in the stripping, disassembly, cleaning, inspection, and reassembly of the unit. Illustrations of the exploded-view type are provided to facilitate overhaul and are indexed in accordance with the procedure of disassembly. A table of fits and tolerances and a paragraph covering adjustments after reassembly are included in the chapter. Requirements and methods for testing the unit after overhaul are furnished, together with instructions on refinishing. Installation details for radio frequency suppression equipment also are included.

51. Preliminary Inspection

Before repairing any part of the equipment, check the unit for the extent of repair necessary, as noted by the operating personnel in DA AGO Form 464. Inspect the unit according to Form 464 as instructed in the TI (technical inspection) column (par. 46). The technical inspection required is completed when this examination is finished and Form 464 is filled out properly.

Section II. CLEANING, STRIPPING, AND INSPECTING

52. Cleaning

Before stripping the unit, thoroughly clean all grease, oil, and dirt from the entire exterior of the unit. Use solvent (SD) for washing when necessary. Do not let the solvent come in contact with any electrical equipment. Blow dirt from inaccessible places with dry, compressed air.

53. Stripping

The following paragraphs contain instructions for stripping the unit of all subassemblies and accessories. To perform a major overhaul, all components and accessories must be removed from the unit for accessibility to the engine and alternator.

Warning: If the unit has been operated for inspection purposes prior to stripping, disconnect the batteries before attempting to repair or overhaul any part of the equipment.

a. UPPER FRAME. The tubular frame is composed of two sections and is constructed to permit removal of the top half. For complete overhaul of the unit, remove the upper frame first. Proceed as follows:

(1) Remove the rear panel and disconnect the alternator leads connected to the compensator transformer (3, fig. 4) and to the wye-delta change board (5, fig. 3).

(2) Disconnect the electrical leads from the d-c generator (14). Pull the leads through the insulator bushings in the firewall.

(3) Disconnect the air line from the air cleaner (6) to the igniter assembly (8). Remove the breather line from the air cleaner to the oil filler tube. Remove the inlet and outlet air duct hose from the air cleaner.

(4) Unplug the 10-conductor socket (11, fig. 2) mounted on the firewall.

(5) Disconnect the cable for the manual choke (5) at the carburetor (9).

(6) Remove the clip securing the cable for the manual throttle (15) and the tube for the primer (14). The clip is located on the firewall.

(7) Disconnect the capacitor from the oil pressure transmitter (19).

(8) Disconnect the two ground straps from the right and left sides of the upper frame.

(9) Remove the nuts securing the upper radiator brackets to the radiator.

(10) Remove the four bolts and nuts securing the upper frame to the lower frame.

(11) Lift the upper frame off the lower frame, being careful not to damage any parts on the unit.

b. RADIATOR. Before removing the radiator (12, fig. 3), open the radiator cap to prevent a vacuum. Drain the coolant through the radiator drain cock (3, fig. 2).

(1) Remove the fan guard (13, fig. 3).

(2) Loosen the radiator hose clamps and remove all necessary hose.

(3) Remove the nuts securing the radiator to the lower frame. Slide the radiator forward in the slots to clear the fan. Then lift the radiator off the frame, being careful not to hit the fan.

c. MUFFLER (fig. 2).

(1) Remove the choke rod from the automatic choke (22) and carburetor (9).

(2) Remove the automatic choke from the exhaust pipe adapter.

(3) Remove the two nuts securing the exhaust pipe adapter to the exhaust manifold.

(4) Loosen the clamp securing the muffler (2) to the lower frame.

(5) Slowly remove the muffler assembly, using care not to damage any parts on the engine.

d. ENGINE SPEED GOVERNOR (fig. 2).

(1) Disconnect the carburetor-to-governor linkage (7) from the governor control arm.

(2) Unscrew the two governor oil lines. A small amount of oil will flow from the governor and can be retrieved with a can.

(3) Loosen the three mounting bolts and slide the governor (6) down. Remove the drive belt from the governor pulley.

(4) Remove the mounting bolts and take the governor from the engine.

e. AIR CLEANER (fig. 3).

(1) Disconnect all air lines and hoses (subpar. *a*(3) above).

(2) Unscrew the four bolts holding the air cleaner (6) to the mounting brackets and remove the air cleaner.

f. CARBURETOR AND OVERSPEED SAFETY GOVERNOR (fig. 2). The carburetor (9) and overspeed safety governor (10) are mounted with the same studs and therefore both can be removed in the same operation. Proceed as follows:

(1) Loosen the clamp holding the carburetor air horn and remove the horn from the carburetor.

(2) Disconnect the cable for the manual choke (5) and disconnect the automatic choke rod from the carburetor choke control.

(3) Disconnect the cable for the manual throttle (15) and the carburetor-to-governor linkage (7) from the carburetor throttle control.

(4) Remove the fuel line from the carburetor.

(5) Unscrew the two nuts mounting the carburetor and overspeed safety governor to the intake manifold.

(6) Lift the carburetor and governor off the manifold.

g. FUEL PUMP (fig. 2).

(1) Disconnect the fuel lines from the fuel pump (4).

(2) Remove the two bolts which secure the fuel pump to the engine.

(3) Remove the pump from the engine.

h. OIL PRESSURE CUTOFF SWITCH AND OIL TRANSMITTER (fig. 2).

(1) Disconnect the electrical leads from the cutoff switch (17) and the oil transmitter (19).

(2) Screw the switch and transmitter out of the tee fitting.

i. FUEL FILTER (fig. 2).

(1) Open the drain cock and drain the fuel from the filter (18).

(2) Disconnect all hose fittings and remove the fuel lines from the filter.

(3) Remove the two bolts securing the filter to the mounting bracket and remove the filter.

j. HIGH COOLANT TEMPERATURE CUTOFF SWITCH (fig. 3).

(1) Disconnect the electrical lead from the cutoff switch (9).

(2) Carefully screw the cutoff switch out of the coolant outlet elbow. Do not damage the thermal element.

k. OIL FILTER (fig. 3).

(1) Disconnect the hose fittings and remove the oil lines from the oil filter (11).

(2) Remove the two bolts securing the oil filter to the bracket on the engine. Remove the filter.

l. IGNITER ASSEMBLY (fig. 3).

(1) Refer to subparagraph *e* above and remove the air cleaner as instructed.

(2) Disconnect the shielded ignition cables from the top of the igniter assembly (8).

(3) Disconnect the ignition lead from the igniter.

(4) Remove the bolt securing the igniter to the engine block.

(5) Slowly pull the assembly from the engine.

m. D-C GENERATOR (fig. 3).

(1) Remove the terminal insulator cap from the terminal board on the capacitor cover. Disconnect the electrical leads from the terminals on top of the generator (14).

(2) Remove the fan guard (13).

(3) Remove the drive belt from the generator pulley.

(4) Unscrew the bolt securing the generator adjusting arm to the generator.

(5) Remove the two bolts securing the generator to the mounting bracket on the engine.

(6) Lift the generator from the unit.

n. STARTING MOTOR (fig. 3).

(1) Refer to subparagraph *m* above and remove the d-c generator as instructed.

(2) Remove the heater shield (19).

(3) Disconnect the electrical leads from the starting motor (7) and solenoid switch.

(4) Disconnect the starting motor ground strap from the engine block.

(5) Unscrew the two mounting bolts securing the starting motor to the flywheel housing.

(6) Remove the starting motor; be careful not to damage the drive gear or flywheel ring gear.

o. WINTERIZATION SYSTEM (fig. 3). To remove individual components of the winterization system, follow the applicable instructions below:

(1) *Heater.*

(*a*) Drain the coolant by using the drain located on the side of the heater (18). (This also will drain the coolant from the engine block.)

(*b*) Remove the heater shield (19).

(*c*) Unplug the socket containing the electrical leads.

(*d*) Disconnect the fuel line at the heater.

(*e*) Loosen the clamp securing the heat exchanger tube to the combustion outlet on the heater.

(*f*) Remove the coolant hoses from the fittings on the heater.

(*g*) Remove the four bolts securing the heater to the mounting bracket. Carefully remove the heater.

(2) *Heat exchanger pan.* Remove the tubes from the heat exchanger pan. Then remove the bolts securing the exchanger to the engine oil pan. Carefully slide the exchanger from the oil pan.

(3) *Fuel pump and fuel control valve.*

(*a*) Carefully disconnect the fuel lines and electrical leads from the heater fuel pump (21) and fuel control valve (20).

(*b*) Remove the bolts and screws securing the pump and valve to the heater control box and take the pump and valve from the unit.

p. D-C VOLTAGE REGULATOR (fig. 4).

(1) Disconnect all electrical leads attached to the regulator base.

(2) Grip the bottom of the rubber vibration mounts with an open-end wrench to prevent tearing the rubber. Remove the attaching nuts.

(3) Lift the voltage regulator and base (5) from the bracket.

Note. To remove the voltage regulator without removing the base, press the spring clips of the regulator base outward, thereby releasing the voltage regulator. Remove the regulator by slipping the tabs from the slotted brackets in the base.

54. Detailed Inspection

This paragraph contains instructions for the disassembly, cleaning, inspection, and reassembly of all subassemblies and accessories removed from the unit in paragraph 53.

a. ENGINE SPEED GOVERNOR (fig. 22). After the engine speed governor has been removed (par. 53*d*), proceed as follows:

(1) *Disassembly.*

(*a*) Remove the pulley (1) by driving the groove pin (2) from the drift shaft (21). Tap the pulley with a soft hammer, if necessary.

(*b*) Remove the adjustment slide (3) and the control arm spring (4).

(*c*) Unscrew the upper adjustment nut (5) and remove the control arm eyebolt (7).

(*d*) Punch the groove pin (8) out of the control shaft (32) and slide the control arm (9) off the shaft.

(*e*) Remove the end bell (10) from the governor body (33). The drive shaft and flyweight assembly will slip out with the end bell.

(*f*) Slide the thrust sleeve (11) and the thrust bearing (12) off the shaft. Press the bearing off the sleeve.

(*g*) Remove the flyweights (13) from the drive shaft by removing the spring clips (14) and the flyweight pins (15).

(*h*) Remove the snap ring (17) with pliers or a screw driver and drive the shaft and bearing (20) from the end bell. Pull the oil retainer (18) from the end bell.

(*i*) Remove the snap ring (19) and pull the bearing off the drive shaft.

(*j*) Using a bearing puller, remove the bearing (22) from the governor body.

(*k*) Pry the plug (23) from the body with a screw driver or punch. Then remove the snap ring (24).

(*l*) Remove the yoke (25). Then remove the bumper screw (26) and the bumper spring (27) by loosening the locknut.

(*m*) Drive the control shaft (32) out of the body and remove the bearing (28) from the body with a bearing puller.

(*n*) Slide the oil retainer (29) off the shaft.

(*o*) Remove the snap ring (30) and pull the bearing (31) from the shaft.

(2) *Cleaning and inspection.* Clean all parts of the governor with fuel oil (D-40 or D-35) or solvent (SD). Inspect all the governor parts for the conditions indicated below.

(*a*) *Pulley* (1). Replace if misalined or dented.

(*b*) *Adjustment slide* (3). Replace if bent or dented.

(*c*) *Control arm spring* (4). Check the spring for free length and tension. Free length should be 2-5/8 inch. The pressure should be between 38 and 46 pounds at 1/4 inch deflection, and 70 pounds at 1/2 inch deflection. Replace if out of tolerance.

(*d*) *Control arm* (9). Replace if bent or damaged.

(*e*) *End bell and governor body* (10, 33). Replace if pitted or cracked.

(*f*) *Thrust sleeve* (11). Replace if worn.

(*g*) *Thrust bearing* (12). Replace if scored or pitted.

(*h*) *Flyweights* (13). Replace if scuffed or if the needle bearings are worn or pitted.

(*i*) *Flyweight pins* (15). Replace if worn.

(*j*) *Bearings* (20, 22, 28, 31). Replace if scored or pitted.

(*k*) *Oil retainers* (18, 29). Replace if worn or if there is evidence of leaking.

(*l*) *Bumper spring* (27). Replace if worn, flexed, or cracked.

(*m*) *Drive shaft and control shaft* (21, 32). Replace if misalined or worn.

(3) *Reassembly.* After cleaning and inspecting to determine the necessary replacement parts, reassemble the governor as follows:

(*a*) Press the bearings (22, 28) into the governor body (33).

(*b*) Slide the bearing (31) on the control shaft (32). Install the snap rings (30) in the shaft groove.

(*c*) Install the control shaft in the governor body and insert the snap ring (24) in the shaft groove. The shaft must turn freely. Tap the oil retainer (29) into the body and insert a new plug (23). Screw the yoke (25) into the shaft.

(*d*) Press the bearing (20) onto the drive shaft (21). Install the snap ring (19) in the shaft groove. Install the flyweight (13) and the flyweight spacers (16) on the shaft with pins (15) and spring clips (14).

(*e*) Press the thrust bearing (12) on the thrust sleeve (11), making certain that the bearing fits snugly against the shoulder on the sleeve. Then slide the bearing and sleeve onto the drive shaft.

(*f*) Lightly tap the oil retainer (18) into the end bell (10). Install the drive shaft in the end bell and insert the snap ring (17) in the end bell groove. Install a new gasket (34) and secure the end bell to the governor body. Tap the pulley (1) on the drive shaft and insert the groove pin (2).

(*g*) Install the control arm (9) on the control shaft (32) with the groove pin (8). Slip the control arm eyebolt (7) into the control arm and secure with the adjusting nut (5).

(*h*) Secure the adjusting slide (3) to the governor body and hook the spring (4) to the adjustment slide and control arm eyebolt.

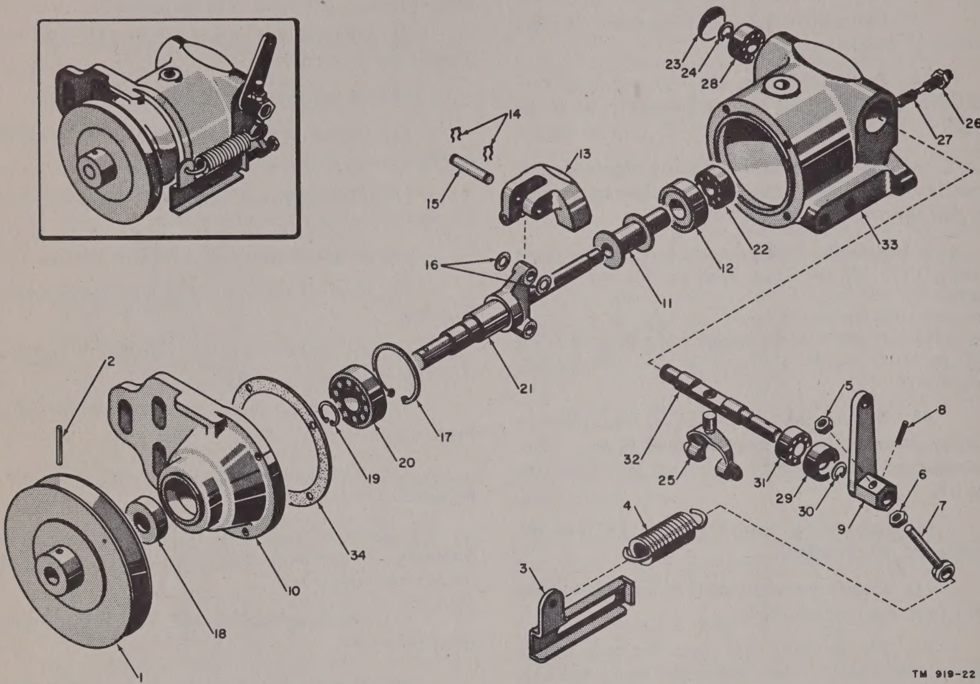

Figure 22. Engine speed governor, exploded view.

1. Pulley (O-116).
2. Groove pin (H412).
3. Adjustment slide (H436).
4. Control arm spring (O-127).
5. Upper adjusting nut (H433).
6. Lower adjusting nut (H434).
7. Control arm eyebolt (H435).
8. Groove pin (H432).
9. Control arm (H428).
10. End bell (A31).
11. Thrust sleeve (O-119).
12. Thrust bearing (O-120).
13. Flyweight (O-122, O-123).
14. Spring clips (H419 through H422).
15. Flyweight pin (H417, H418).
16. Flyweight spacers (H423 through H426).
17. Snap ring (H416).
18. Oil retainer (H413).
19. Snap ring (H415).
20. Bearing (O-117).
21. Drive shaft (O-118).
22. Bearing (O-121).
23. Plug (H409).
24. Snap ring (H410).
25. Yoke (H427).
26. Bumper screw (H411).
27. Bumper spring (O-115).
28. Bearing (O-114).
29. Oil retainer (H430).
30. Snap ring (H431).
31. Bearing (O-125).
32. Control shaft (O-124).
33. Governor body (A32).
34. Gasket (H414).

(*i*) Install the bumper spring (27) and the bumper screw (26) in the governor body and tighten the locknut.

b. AIR CLEANER (fig. 13). Refer to paragraph 36*b*(2) and disassemble and clean the air cleaner as instructed.

c. CARBURETOR (fig. 23). After the carburetor has been removed from the unit (par. 53*f*), proceed as follows:

(1) *Disassembly.*

(*a*) Remove the air horn (1) with all parts attached.

(*b*) Remove the throttle shaft arm (3) with all parts attached.

(*c*) Remove the bowl cover (6) with all parts attached.

(*d*) Remove the pump-jet-passage plug (7), gasket (8), and pump jet (9) from the body (28).

(*e*) Remove the low-speed-jet plug (10), gasket (11), and low speed jet (12).

(*f*) Remove the altitude-adjusting screw (13) and the spring (14).

(*g*) Remove the idle-well plug (15), gasket (16), and idle-well jet (17).

(*h*) Remove the nozzle-passage plug (18), gasket (19), nozzle-retainer plug (20), nozzle (21), and nozzle gasket (22).

(*i*) Remove the idle-adjusting screw (23) and the spring (24).

(*j*) Remove the metering-rod jet (25) and the gasket (26).

(*k*) Remove the flange (27) from the body (28). Remove the insulator (29) and the gaskets (30).

(*l*) Remove the strainer-passage plug (31), gasket (32), strainer (33), intake-ball-check plug (34), and discharge-disk check plug (35).

(*m*) Remove the idle-port-rivet plug (36).

(*n*) Remove the throttle valve (37) and the throttle shaft and lever assembly (38).

(*o*) Remove the choke valve (40), choke shaft (41), choke lever extension (42), and choke operating arm (43).

(*p*) Remove the metering rod (45), metering-rod disk (46), pump arm and collar assembly (49), connector link (48), spring clip (47), pump operating lever assembly (50), float (54), needle valve and seat assembly (55), and pump (52) from the bowl cover (6).

(2) *Cleaning and inspection.* Clean all castings and parts of the carburetor with solvent (SD). Blow out all passages with compressed air. Check the bowl cover (6) for warpage. Examine each part, and replace those parts showing wear or damage. Clean carbon from the bore of the flange (27) by scraping, or with sandpaper; do not use emery cloth.

(3) *Reassembly.* To reassemble the carburetor, follow the instructions below. Install all parts securely and use all new gaskets.

(*a*) Position the bowl-cover gasket (56) on the bowl cover (6). Install the needle valve and seat assembly (55) in the bowl cover. Then attach the float (54) with the float pin (53).

(*b*) Install the pump jet (9), gasket (8), and pump-jet-passage plug (7) in the carburetor body (28).

(*c*) Install the discharge-disk-check plug (35) and the intake-ball-check plug (34). Insert the strainer (33) in the recessed portion of the strainer-passage plug (31). Then install the strainer-passage plug as assembled.

(*d*) Install the throttle shaft and lever assembly (38) and the throttle valve (37). Install the valve with the C toward the idle port opening and facing the manifold side of the flange (27). Tap the throttle valve lightly to centralize it in the bore of the carburetor. Hold the valve in place and securely tighten the screws. Always use new screws.

(*e*) Install the new idle-port-rivet plug (36). Then install the idle adjusting screw (23) and the spring (24).

(*f*) Assemble the flange (27) to the body (28). Use new gaskets (30). Line up holes in the body casting with holes in the insulator (29), gaskets (30), and flange before tightening the screws. Use lockwashers.

(*g*) Install the idle-well jet (17), gasket (16), and idle-well-jet-passage plug (15) in the body.

(*h*) Install the low-speed jet (12), working well into the seat to insure a good seal. Then install the gasket (11) and the low-speed-jet-passage plug (10).

(*i*) Install the gasket (26) and the metering-rod jet (25).

(*j*) Slip the pump (52) into the body (28) and secure the bowl cover (6) as assembled. Tighten the screws evenly and securely.

(*k*) Install the pump arm and collar assembly (49) and the pump operating lever assembly (50) to the bowl cover. Attach the connector link (48) with the spring clip (47).

(*l*) Install the washer (39), and throttle shaft arm (3) on the throttle shaft. Then attach the throttle connector rod (4), using the new spring retainer (5) at the lower end and the spring clip (2) at the top.

(*m*) Install the metering rod (45) and the disk (46). Secure with the spring clip (44).

(*n*) Install the nozzle gasket (22) and the nozzle (21) with the flat side facing up. Then install the nozzle-retainer plug (20), gasket (19), and nozzle-passage plug (18).

(*o*) Install the altitude-adjusting screw (13) and the spring (14).

(*p*) Attach the air horn (1) on the carburetor body. Tighten the screws evenly and securely.

(*q*) Install the choke shaft (41), choke lever extension (42), choke operating arm (43), and the choke valve (40). Centralize the valve in the air horn, then securely tighten the screws. Always use new screws.

d. ENGINE OVERSPEED SAFETY GOVERNOR (fig. 24). After the overspeed safety governor has been removed from the unit (par. 53*f*), proceed as follows:

(1) *Disassembly.*

(*a*) Remove the seal (1), seal pin (2), cover screws (3), cover (5), and gasket (6). Back out the adjusting screw (7). Remove the fulcrum clip (9) and lift the cam assembly (10) off the fulcrum. Remove the spring block (11) from the spring (12) by holding the spring and turning the block clockwise. Lift the spring out of the spring link end of the cam.

(*b*) Remove the two housing-to-flange screws (13) and the throttle plate screws (14). Then slip out the throttle plate (16) and the stabilizer piston (17). Press the bolt-hole tube (20) from the flange (21). Remove the shaft and lever assembly (22). The bearings (23) and shim washer (26) will fall out of the housing (24).

(*c*) Remove the stabilizer piston (17) and piston-link spacers (19) from the throttle plate (16) by pressing the piston pin (18) from the piston.

(*d*) Fasten the flange in a vise with the cylinder cap (25) down and insert a bent rod through the cylinder. Tap until the cap comes off.

(2) *Cleaning and inspection.* Wire all parts together and clean and rinse in solvent (SD) or carbon tetrachloride. Inspect all parts for wear. Pay special attention to the cam, link, shaft, and piston.

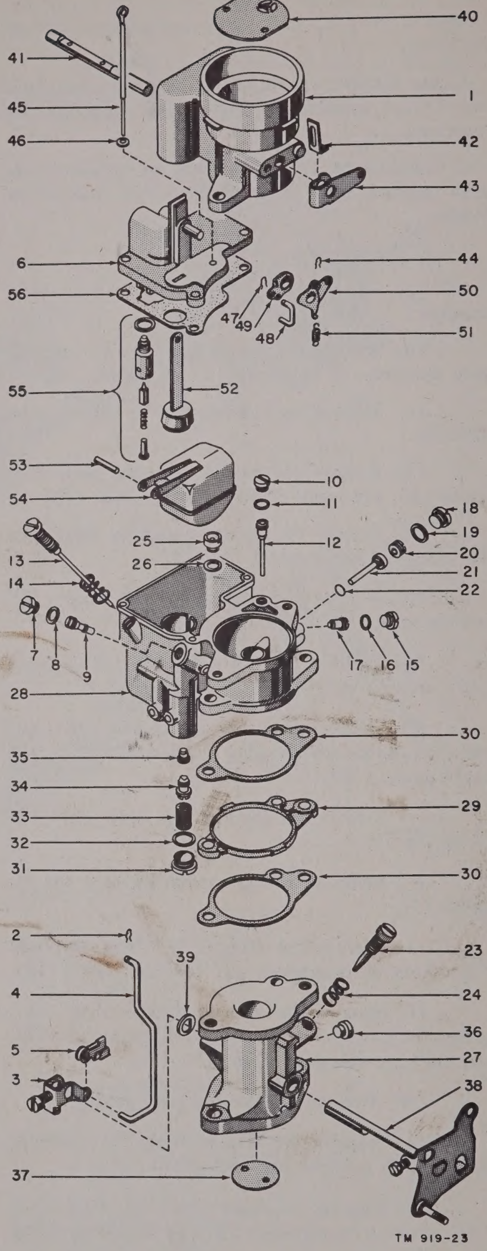

Figure 23. Carburetor, exploded view.

LEGEND FOR FIGURE 23

1. Air horn (A22).
2. Spring clip (H367).
3. Throttle shaft arm (H389).
4. Throttle connector rod (H374).
5. Spring retainer (H375).
6. Bowl cover (A23).
7. Pump-jet-passage plug (H381).
8. Gasket (part of H381).
9. Pump jet (H382).
10. Low-speed-jet plug (H370).
11. Gasket (part of H370).
12. Low-speed jet (H373).
13. Altitude-adjusting screw (H368).
14. Spring (O-107).
15. Idle-well plug (H379).
16. Gasket (part of H379).
17. Idle-well jet (H380).
18. Nozzle-passage plug (H372).
19. Gasket (part of H372).
20. Nozzle-retainer plug (H376).
21. Nozzle (H377).
22. Nozzle gasket (H378).
23. Idle-adjusting screw (H393).
24. Spring (O-110).
25. Metering-rod jet (H363).
26. Gasket (part of H363).
27. Carburetor flange (A25).
28. Carburetor body (A24).
29. Insulator (H384).
30. Gaskets (H385, H386).
31. Strainer-passage plug (H391).
32. Gasket (part of H391).
33. Strainer (H392).
34. Intake-ball-check plug (O-109).
35. Discharge-disk-check plug (H383).
36. Idle-port-rivet plug.
37. Throttle valve (O-112).
38. Throttle shaft and lever assembly (O-111).
39. Washer (H390).
40. Choke valve (O-100).
41. Choke shaft (O-101).
42. Choke lever extension (H360).
43. Choke operating arm (H365).
44. Spring clip (H359).
45. Metering rod (H357).
46. Metering rod disk (H358).
47. Spring clip (H363).
48. Connector link (H364).
49. Pump arm and collar assembly (O-103).
50. Pump operating lever assembly (O-102).
51. Spring (O-104).
52. Pump plunger (O-105).
53. Float pin (H361).
54. Float (O-106).
55. Needle valve and seat assembly (H366).
56. Bowl-cover gasket (H362).

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make sure that adequate ventilation is provided.

(3) *Reassembly.* After cleaning and inspection, reassemble the overspeed safety governor. Use new parts wherever necessary.

(*a*) Insert the shaft (22) through the housing (24). Place the bearings (23) around the shaft in the sleeve, and position the shim washer (26) over the shaft and bearings.

(*b*) Put the shaft through the hole in the flange (21) and secure the flange to the housing with the screws (13). Press the bolt-hole tube (20) in the flange.

(*c*) Assemble the piston (17) to the throttle plate (16) and secure it to the shaft. Press on the cylinder cap (25).

(*d*) Attach the spring (12) to the cam assembly (10). Then turn the spring block (11) into the spring until three to four active coils are attained. Put the cam on the fulcrum pin and fasten with the clip (9).

(*e*) Insert the adjusting screw (7) into the housing and the spring block. Turn the screw until the distance from the inside of the housing (at adjusting screw end) to the spring block measures 5/8 inch. Put the seal pin (2) through the adjusting screw cap. Do not seal the pin until the governor has been adjusted (par. 62*e*).

(*f*) Use a new gasket (6), and secure the cover (5) to the housing. Lock the attaching screws with a new seal (1).

e. FUEL PUMP (fig. 25). After the fuel pump has been removed (par. 53*g*), proceed as follows:

(1) *Disassembly.*

(*a*) Loosen the bail thumb nut, swing the wire bail and screw assembly (1) out of position and remove the bowl (2) and bowl gasket (3).

(*b*) Remove the strainer screen (4) from the top cover (5).

(*c*) Mark the edges of the top cover and body (6) with a file to assure that the parts will be reassem-

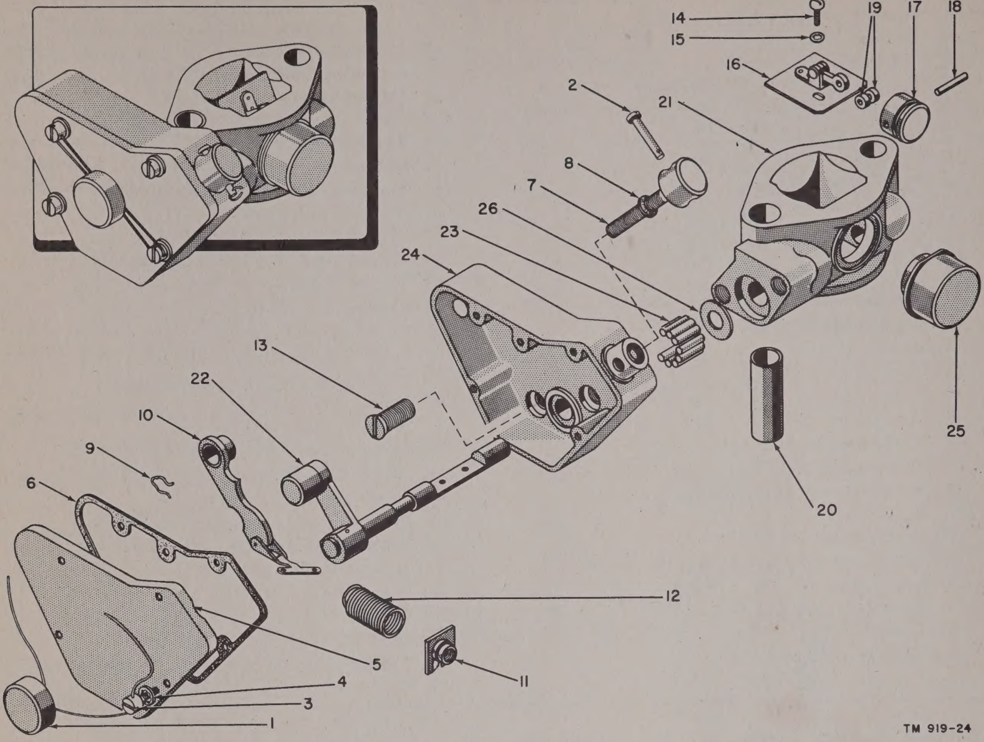

Figure 24. Overspeed safety governor, exploded view.

1. Seal.
2. Seal pin.
3. Cover screw.
4. Lockwasher.
5. Cover.
6. Cover gasket.
7. Adjusting screw.
8. Adjusting screw washer.
9. Fulcrum clip.
10. Cam assembly.
11. Spring block.
12. Spring.
13. Housing-to-flange screw.
14. Throttle plate screw.
15. Lockwasher.
16. Throttle plate assembly.
17. Stabilizer piston.
18. Piston pin.
19. Piston link spacer.
20. Bolt-hole tube.
21. Flange.
22. Shaft and lever assembly.
23. Bearings.
24. Housing.
25. Cylinder cap.
26. Shim washer.

bled in the same position. Then remove the top cover screws and lockwashers. Jar the top cover loose from the body with a screw driver handle and lay it on a bench with the diaphragm flange up.

(*d*) Remove the two screws (7) holding the valve and cage retainer (8). Then lift out the valve and cage retainer, the two valve and cage assemblies (9, 10), and the gasket (11).

(*e*) Drive the rocker arm pin (12) out of the body with a punch and hammer. Remove the rocker arm

(13), spring (14), and link (15). Lift out the diaphragm (16), spring retainer (17), and spring (18).

(2) *Cleaning and inspection.* Clean and rinse all parts in solvent (SD). Blow out all passages with compressed air. Inspect all parts of the fuel pump as follows:

(*a*) *Top cover and pump body* (5, 6). Make a visual check for cracks and breakage. Inspect for diaphragm flange warpage by testing on a smooth, flat surface. Examine all threaded holes for stripping or crossed threads. Broken, damaged, or severely warped castings must be replaced.

(*b*) *Valve and cage assemblies* (9, 10). Replace. Extent of wear cannot be determined visually.

(*c*) *Strainer screen* (4). Replace. Inspect new screen for damage or obstruction. Screen must fit snugly around inner and outer edges.

(*d*) *Rocker arm* (13). Inspect for wear or scores on camshaft pad and on point of contact with link and pull rod.

(*e*) *Rocker arm pin* (12). Replace pin.

(*f*) *Link* (15). Replace link. Amount of wear cannot be determined visually.

(*g*) *Rocker arm spring and diaphragm spring* (14, 18). Replace. Spring may be weak from distortion or corrosion.

(*h*) *Diaphragm* (16). Always replace.

(*i*) *Gaskets* (3, 11). Replace.

(3) *Reassembly.* After cleaning and inspection, reassemble the fuel pump as follows:

(*a*) Soak a new diaphragm (16) in clean oil (D-40 or D-35) while performing the following steps:

(*b*) Place the rocker arm (13) and the link (15) in the body (6) with the link hook down. Then aline the rocker arm pin hole with the hole in the body and drive in the rocker arm pin (12). Install the rocker arm spring (14).

(*c*) Place the diaphragm spring (18) over the pull-rod well in the body. Place the spring retainer (17) on the spring and hook in the diaphragm assembly to the link by pressing the diaphragm against the spring.

(*d*) Place the valve gasket (11) in position in the top cover (5) and insert the two valve and cage assemblies (9, 10). The outlet valve (9) must have the three-legged spider facing into the top cover, and the inlet valve (10) must have the three-legged spider facing out of the top cover. Secure the valve and cage assemblies with the valve retainer (8) and the two retainer screws (7).

(*e*) Turn the top cover so that the diaphragm flange rests on the bench, and install the strainer screen (4), bowl gasket (3), and bowl (2) in that order. Swing the wire bail and screw assembly (1) into position and tighten the thumb nut.

(*f*) Install the top cover on the body. Be sure to line up file marks. Install the screws and lockwashers and tighten until the screws just engage the lockwashers. Push the rocker arm in a full stroke. Allow it to snap out under power of the diaphragm spring. (Sufficient diaphragm cloth must be pulled inside the pump before the screws can be tightened, or the pump will deliver too much pressure.)

(*g*) Tighten the cover screws alternately and securely.

f. FUEL FILTER (fig. 15). Refer to paragraph 36*b*(4) and disassemble and clean the fuel filter as instructed.

g. OIL FILTER (fig. 14). Refer to paragraph 36*b*(3) and disassemble and clean the oil filter as instructed.

h. IGNITER ASSEMBLY (fig. 26). After the igniter assembly has been removed (par. 53*l*), proceed as follows:

(1) *Disassembly.*

(*a*) Take out the six screws securing the cover (1) and lift the cover off the base (41). Remove the cover seal (2) from the top of the base.

(*b*) Sketch the relationship between the rotor (3) and the offset drive tongue on the bottom of the drive shaft (40) to facilitate reassembly. Pull the rotor from the top of the cam and stop plate (11).

(*c*) Disconnect the primary leads from the ignition coil (5). Remove the two mounting screws (4) and lift the coil out of the base.

(*d*) Take out the two breaker-plate screws (6) and clamps (7). Remove the breaker plate (8) from the base.

(*e*) Remove the felt wick (9) from the cam sleeve. Take out the snap ring (10) in the sleeve. Lift off the cam and stop plate.

(*f*) Slip the governor springs (13) off the lugs on the weight plate. Slide the governor weights (14) off the pivots and remove the springs from the weight pins.

(*g*) Take out the attaching screw (15) and remove the advance arm (18) and thrust washer (19).

(*h*) Take out the four screws and remove the primary connector (21).

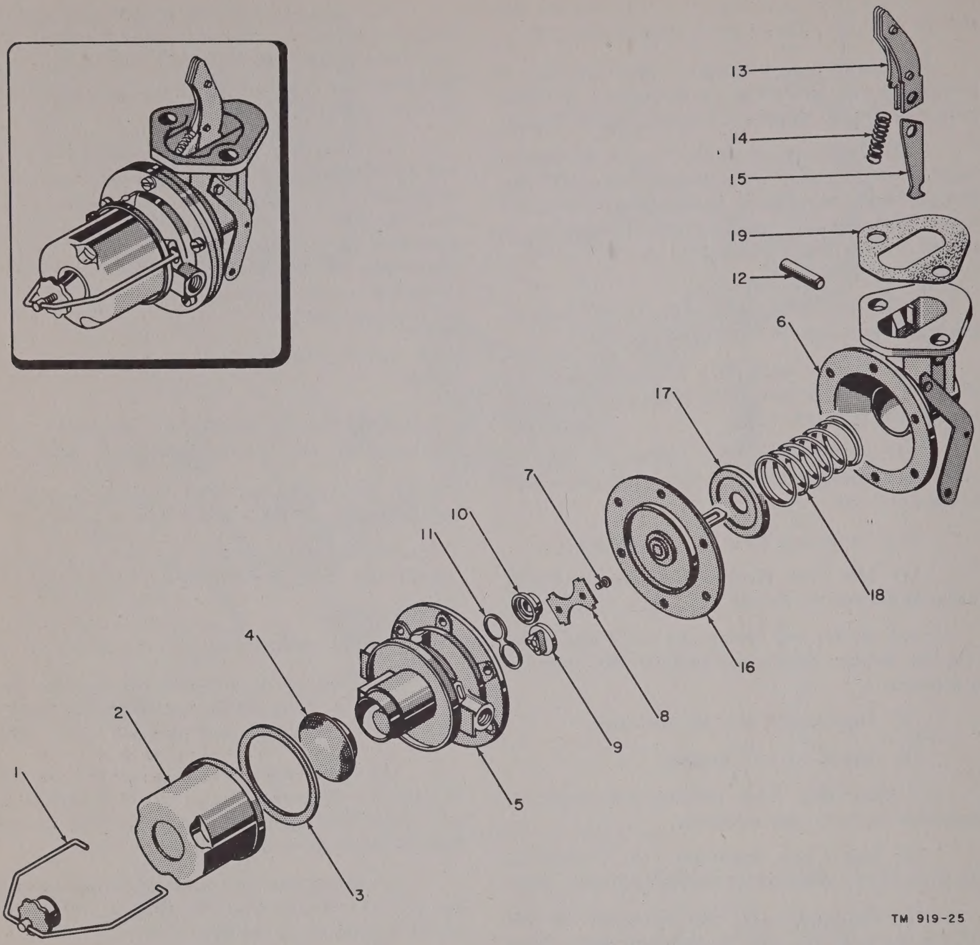

Figure 25. Fuel pump, exploded view.

1. Wire bail and screw assembly (H343).
2. Pump bowl (A20).
3. Bowl gasket (H344).
4. Strainer screen (H346).
5. Top cover (A21).
6. Pump body (O-95).
7. Retainer screw.
8. Valve and cage retainer (H348).
9. Outlet valve and cage assembly (O-97).
10. Inlet valve and cage assembly (O-96).
11. Valve gasket (H 347).
12. Rocker arm pin (H353).
13. Rocker arm (H356).
14. Rocker arm spring (O-98).
15. Link (H355).
16. Diaphragm (O-93).
17. Spring retainer (H345).
18. Diaphragm spring (O-94).
19. Pump gasket (H354).

(2) *Cleaning and inspection.* Clean all igniter assembly parts and inspect for abnormal conditions as instructed below.

(*a*) *Distributor cap.*

1. Take out the three screws and remove the cap (23) from the cover (1). Remove the rubber washers (25) from the cap towers.

2. Discard the cap if it is cracked, has corroded terminals, or if carbon runners have formed on either the inside or the outside surfaces. Inspect the contacts on the inside of the cap. After normal use, the contacts become slightly burned on the inside tip. If burning is excessive or uneven, replace the cap. Burning on the horizontal face of the contacts indicates that the rotor is too short and must be replaced. Clean the contacts with carbon tetrachloride but do not file. Do not clean the carbon contact with solvent. Wipe thoroughly and inspect for cracks and oil-soaked condition. Replace the cap if the carbon contact is not in good condition.

3. Replace the rubber sealing washers if they are rough or do not fit properly.

4. Thoroughly clean the cap cover in solvent (SD) and inspect for cracks or other damage. Place the cover on the base and inspect to make sure it touches the base on all sides. Replace the cover if distorted.

5. Place the rubber washers on the cap towers and install the cap in the cover. Install the three screws and tighten evenly.

(*b*) *Rotor* (3). Discard the rotor if it is cracked or has a loose or burned contact strip. Inspect the end of the contact. If burning is excessive, replace the rotor. If burning is only slight, clean with carbon tetrachloride. Do not file. Inspect the contact spring and replace the rotor if the contact does not spring back instantly when the contact button is pressed against the rotor. Clean the button on the carbon contact in the center of the cap.

(*c*) *Ignition coil* (5). Test with a coil tester.

(*d*) *Breaker plate* (8).

1. Remove the breaker-spring clamp screw (26), washers (27, 28), and clamp (29). Take off the coil primary lead (30). Remove the stationary contact lock screw (31) and lift the breaker contact (32) from the breaker plate (8). Take out the capacitor mounting screw (33) and the lockwasher (34). Then lift the capacitor (35) off the breaker plate.

2. Clean all parts with cloth dampened in solvent (SD).

3. Rub contacts with linen tape that has been dampened in carbon tetrachloride. Dry with clean tape to remove any residue.

4. Test the capacitor for capacitance and grounds on a conventional tester. Replace the capacitor if grounded, leaky, or if capacitance is not within the range of .18 to .21 uf. Replace the capacitor if the lead or terminal is chafed, partially broken, or damaged.

5. Inspect the plate for stripped threads and a damaged or worn pivot pin, and replace the plate if these conditions are found. Check the primary terminal for grounds, with test probes, and replace the plate if the terminal is grounded.

6. Inspect the contacts. If they are a grayish color and are not pitted or burned, they need not be replaced. Replace the contacts if rough, burned, or pitted.

7. Install the contacts on the plate. They must turn easily without binding. Remove the contact assembly and inspect the pivot. Replace the plate if wear is evident on the pivot, or if the pivot is loose or not perpendicular to the plate. If the pivot is in good condition, install new contacts to obtain correct pivot fit.

8. Assemble the contacts, capacitor, and primary lead on the plate. The distributor lever spring and connector should be installed on the inside of the terminal.

9. Place 1 drop of oil (OE 10) on the distributor lever pivot pin. Operate the lever once or twice and remove excess oil.

(*e*) *Primary connector* (21).

1. Clean with a cloth dampened with solvent (SD).

2. Inspect for damaged or corroded connector pin, capacitor, lead, and terminal. Check for grounds with test probes and replace if grounded.

3. Inspect the gaskets and gasket seats and replace if rough or damaged.

(*f*) *Cam* (11). Clean the cam in solvent (SD) and inspect the cam lobes and weight slots for wear. Replace the cam if the lobes are grooved or if the sides of the weight slots are rough.

(*g*) *Governor.* Clean the weights (14), springs (13), snap ring, and spacer in solvent (SD) and dry thoroughly. Replace the weights if the pivot holes are worn or fit loosely on the pivot. Replace the spring if bent or distorted.

(*h*) *Base and shaft* (41, 40).

1. Wipe the shaft and inside of the base as clean as possible with cloth dampened in solvent (SD). Do not soak. Dry immediately with clean, dry, compressed air.

2. Inspect the base for cracks or other damage. Make sure that the groove for the cap seal ring is smooth and clean. Remove the plug in the side of the base and take out the felt wick. Inspect the wick for damage and soak in oil (OE). Fill the wick cavity with grease (GL) and insert the wick. Wipe off excess grease. Install the plug.

3. Clamp a dial indicator on the base with the plunger resting against the side of the shaft. With a spring scale, apply a 5-pound pull in line with the plunger. Install a new drive shaft bearing if the side play is more than .005 inch.

4. Clamp the dial indicator on the base with its plunger against the end of the shaft. Move the shaft to its two extreme positions and read the end play. End play can be measured with a flat feeler gage inserted between the shaft collar and the lower thrust washer. If the end play is less than .003 inch, tap the lower end of the shaft to loosen. If the end play is more than .010 inch, remove the collar and install additional thrust washers between the base and the gear.

5. If it is necessary to repair the drive shaft, remove the rivet (36) and take the collar (37) off the shaft. Take off the lower thrust washer (38) and remove the burr from the rivet hole in the shaft. Pull the shaft out of the base and remove the upper thrust washer (39) and the oil seal. Drive out the old bearings in the base with an arbor or a bolt that rests on the bearings without gouging the bearing bore. Press new bearings into place. In-

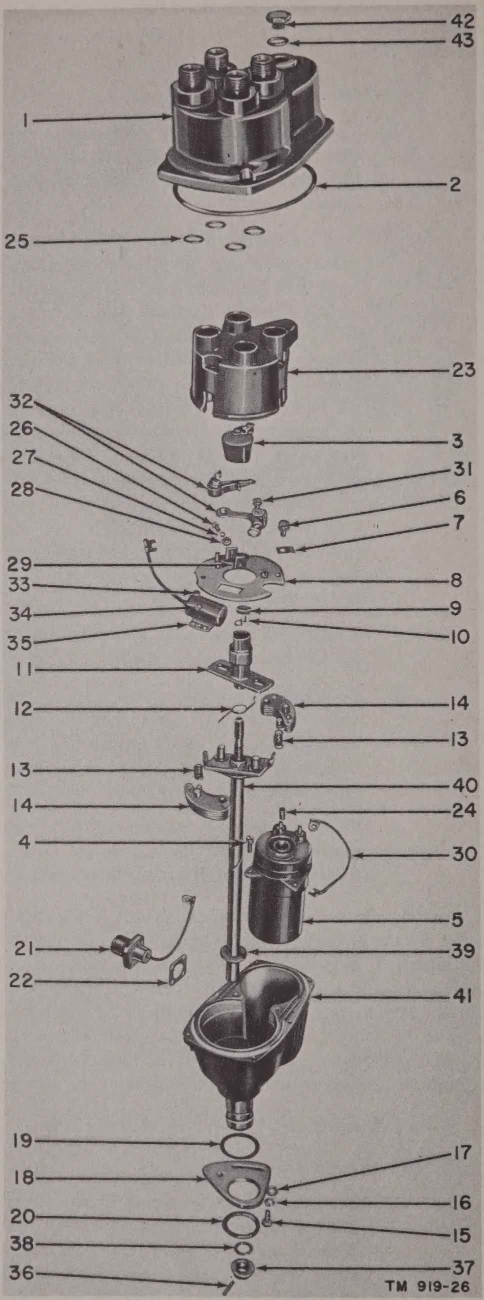

Figure 26. Igniter assembly, exploded view.

LEGEND FOR FIGURE 26

1. Cover (E25).
2. Cover seal ring.
3. Rotor (E26).
4. Coil bracket screw.
5. Ignition coil (T1).
6. Breaker-plate screw.
7. Breaker-plate clamp.
8. Breaker plate.
9. Cam sleeve felt wick.
10. Snap ring.
11. Cam and stop plate (O-131).
12. Anti-rattle spring.
13. Governor weight spring.
14. Governor weight.
15. Advance arm screw.
16. Lockwasher.
17. Plain washer.
18. Advance arm.
19. Advance arm thrust washer.
20. Gasket.
21. Primary connector.
22. Gasket.
23. Distributor cap (E5).
24. Contact spring.
25. Cap sealing washer.
26. Breaker-spring clamp screw
27. Lockwasher.
28. Plain washer.
29. Breaker-arm spring clamp.
30. Coil primary lead.
31. Breaker-contact lock screw.
32. Breaker contact (E7).
33. Capacitor mounting screw.
34. Lockwasher.
35. Capacitor (C2).
36. Collar rivet.
37. Shaft collar.
38. Lower thrust washer.
39. Upper thrust washer.
40. Drive shaft (O-131).
41. Base (A34).
42. Cap cover plug.
43. Cover plug gasket.

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stall the lower bearing flush with the bottom of the base and install the upper bearing flush with the face of the bearing bore. Continue the oil hole in the base through the new bearing, using a drill of the same diameter. Remove all burrs from the inside of the bearing. Use care not to mar the bearing. Soak the bearings in oil (OE 30) and drain off excess oil. Do not get oil in the upper part of the base. If the shaft is removed, assemble the governor and install the cam. Grease the upper thrust washer with grease (GL) and install the shaft. Place the shaft in the bearings and install the lower thrust washer and collar. Drill the rivet hole in the shaft to correspond with the hole in the collar and install the rivet. Check side and end play of the shaft.

Note. A cross-sectional view of the igniter assembly is shown in figure 27.

(3) *Reassembly.* After cleaning and inspection, reassemble the igniter assembly as follows:

(*a*) Place a small amount of grease (GL) on the weight pivot pins, weight pivot holes, cam yoke slots, and weight spring lugs and pins. Place the governor weights (14) in position and install the governor springs (13) on the weight pins. Make sure the springs are seated properly on the weight pins and plate.

(*b*) Apply a film of oil (OE 30) to the upper end of the drive shaft (40). Place the cam (11) in position over the shaft and weights. Place the rotor (3) on the cam, and check the relation between the rotor and the drive tongue. If not correct, lift the cam and turn 180°. Remove the rotor. Install the cam snap ring (10) and the felt wick (9). Add 5 to 10 drops of oil (OE 30) to wick.

(*c*) Place the breaker plate (8) in the base and turn so that the locating lug fits into the slot. Install the plate mounting screws and clamps.

(*d*) Place the primary connector (21) and gasket (22) in position on the base and inspect to insure a tight fit. Install the attaching screws.

(*e*) Place the ignition coil (5) in position in the base and arrange the leads so that they will reach the coil terminals without kinking or cramping. Install the coil mounting screws (4) and the primary lead retaining clips.

(*f*) Adjust the contact gap as follows: Turn the shaft so that the distributor lever rubbing block is on the high point of the cam. Loosen the stationary contact lockscrew slightly. Adjust the gap to .020 inch by turning the adjusting cam. To check the contact gap, use a wire feeler gage, with which there is less chance for error than with a flat gage. Tighten the lockscrew. Turn the shaft until the contacts close. Bend the stationary contact bracket to aline the contacts for full-face contact. Readjust the gap after alining the contacts.

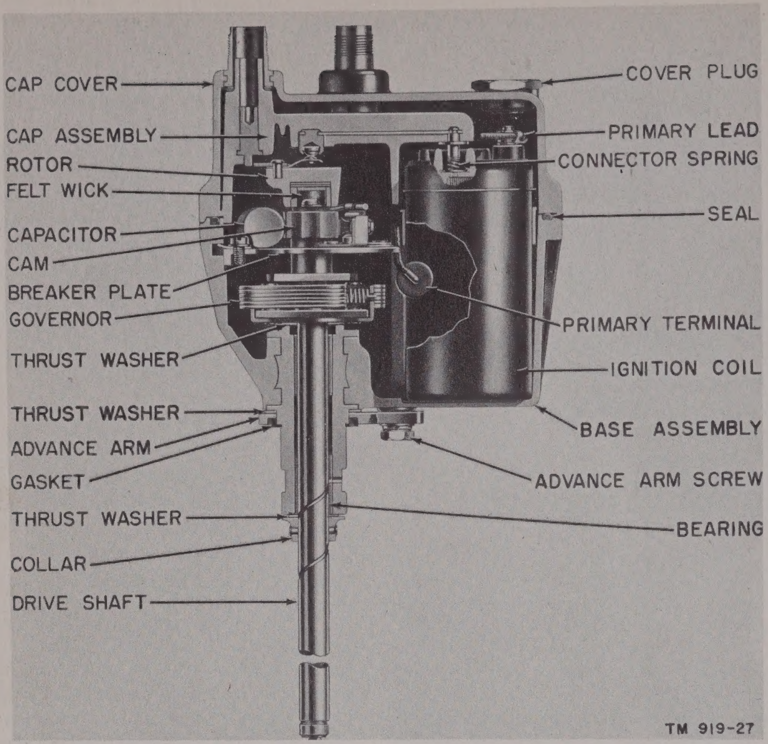

CAP COVER
CAP ASSEMBLY
ROTOR
FELT WICK
CAPACITOR
CAM
BREAKER PLATE
GOVERNOR
THRUST WASHER
THRUST WASHER
ADVANCE ARM
GASKET
THRUST WASHER
COLLAR
DRIVE SHAFT
COVER PLUG
PRIMARY LEAD
CONNECTOR SPRING
SEAL
PRIMARY TERMINAL
IGNITION COIL
BASE ASSEMBLY
ADVANCE ARM SCREW
BEARING
TM 919-27

Figure 27. Igniter assembly, cross-sectional view.

(*g*) Adjust the contact pressure as follows: Hook a spring scale on the lever at the contact. Take a reading as the contacts separate. Adjust the tension to 17 to 20 ounces by loosening the screw holding the contact lever spring. Slide the spring in or out as necessary. Tighten the screw and check the pressure.

(*h*) Place the rotor (3) on the cam (11) and press down firmly. Turn the leads so that they will not interfere with the rotor.

(*i*) Install the seal ring (2) in the groove in the base (41). Install the coil contact spring (24) on the cap connector pin. Place the cover (1) on the base, taking care that the spring enters the coil high-tension terminal and that the seal ring is in its proper place. Make sure that leads are not pinched between the cover and the base. Install the cap attaching screws and tighten evenly and thoroughly.

(*j*) To check for leaks, connect an air hose to one of the ventilating holes in the base and install plugs in the other holes. Apply 6 pounds of air pressure and submerge the unit in water. If bubbles occur at any point except around the drive shaft, the leak must be eliminated.

i. D-C GENERATOR (fig. 28). After the d-c generator has been removed (par. 53*m*), proceed as follows:

(1) *Disassembly.*

(*a*) Remove the screws securing the capacitor cover plate (1) and remove the plate and gasket (2). Remove the two screws securing the commutator end of the capacitor cover (4) and loosen the remaining four screws. Remove the four screws in the end of the commutator end cover and then slip the cover (3) off the generator. Disconnect the jumpers to the brush rigging and interpole. Melt the solder and disconnect the field lead from the connector plate. Then remove the capacitor cover (4) and gasket (5).

(*b*) Remove the pulley (8) and external fan (9) as an assembly by removing the hexagon locknut (6) and washer (7). Then tap the shaft lightly with a hammer to break the pulley loose. Collect the key (10).

(*c*) Remove the screws securing the drive end housing (12) to the field ring assembly (24). Tap the commutator end of the shaft to remove the armature assembly (18) and the drive end housing. To remove the drive end housing from the armature, remove the four screws securing the bearing retainer (11) and tap the housing from the bearing. If the drive end housing cannot be removed in this manner, use an arbor press.

(*d*) Remove the spanner nut (13), tabbed lockwasher (14), and guard washer (15) from the armature shaft. Then pull the bearings (16, 17) from the shaft.

(*e*) Remove the commutator end housing (19) and brush rigging (23) by removing the square-head screws securing the assembly to the field ring (24). Mark the brush rigging and housing so that rigging may be assembled in the same location. Then remove the brush rigging by removing the four screws and bracket lock clamps.

(*f*) Remove the brush springs (21) by removing the cotter pin and spring pin (20). Remove the brush lead screws and slip the brushes (22) from the rigging.

(2) *Cleaning and inspection.* Clean all the d-c generator parts and inspect for abnormal conditions as instructed below.

(*a*) *Brushes and brush springs* (22, 21).

1. Blow out the brush dust from the brush rigging (23) with dry, compressed air.

2. Replace all brushes on reassembly. All new brushes must be fully seated for proper commutation. Use a piece of #0000 sandpaper wrapped around the commutator with the sanded side facing the brushes, and rotate the generator slowly by hand. The brushes will seat themselves to the contour of the commutator.

3. The brush spring pressure must be between 1.3 and 2.2 pounds when deflected 1/2 inch. Replace springs that are not standard.

(*b*) *Armature* (18).

1. Clean the commutator with a cloth moistened in carbon tetrachloride. Smooth the commutator with #0000 sandpaper. If a brownish brush film is established, do not sand the commutator unless absolutely necessary.

2. If the commutator is extremely rough or eccentric, mount the armature in a lathe and take a light cut across the face of the commutator (approximately .005 inch). Do not take a cut off the commutator risers into which the armature wires are soldered. The minimum diameter to which the commutator can be turned is 2.5 inch. After turning, carefully undercut the mica to a depth of .020 inch. Smooth and polish the commutator to remove any burrs that might have developed from undercutting the mica. Use #0000 sandpaper.

3. Test the armature for short circuits, open circuits, or grounds. When testing with a lamp circuit, use a 220-volt a-c line with a 50-watt lamp. If only a 110-volt line is available, it may also be used with a 50-watt lamp.

4. Touch one test lamp prod to the armature shaft or to the core laminations and the other prod to the commutator copper segments. If the lamp lights, the armature is grounded.

5. Inspect the armature to insure that all the wire ends are soldered firmly in the commutator risers. If such is the case, it may be assumed that there is no open circuit.

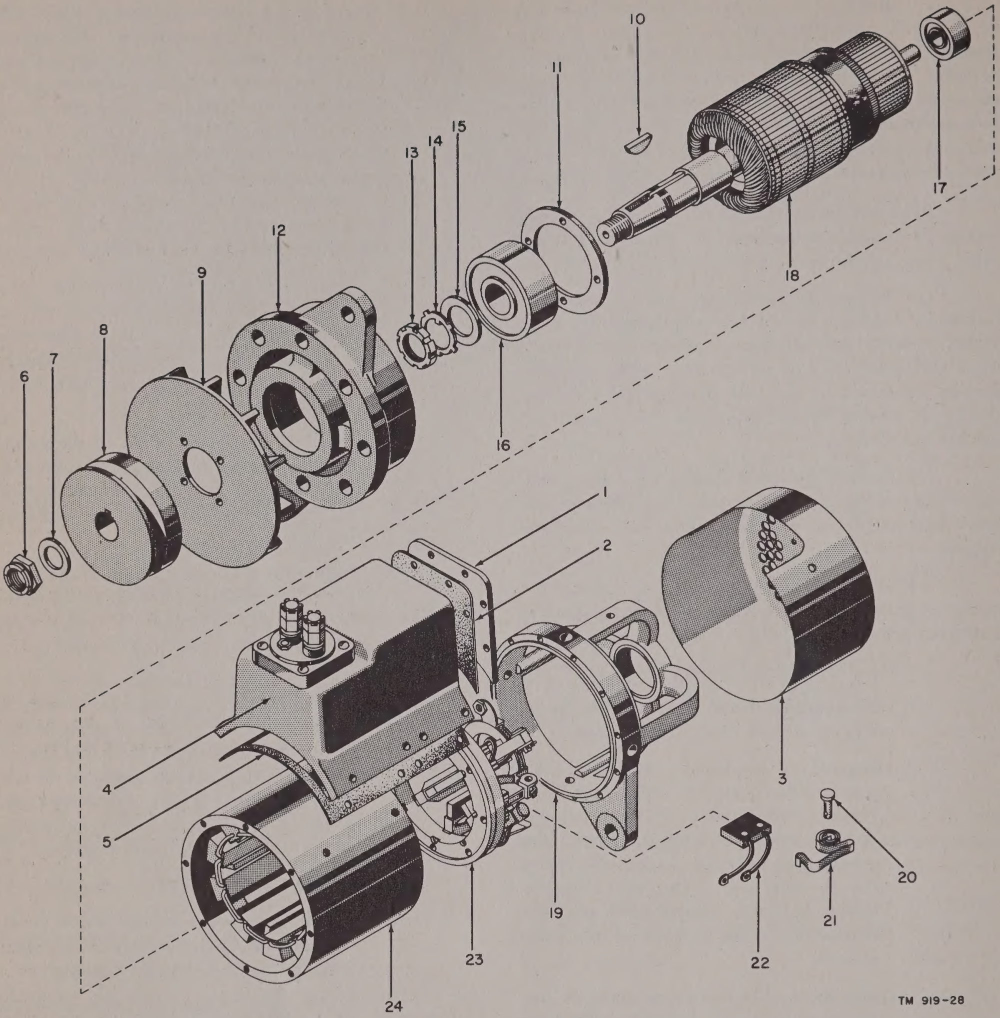
6. Test the armature for short circuits in a growler which is so constructed as to have its laminations in the same spacing as the main pole pieces in the field ring assembly (24). Make certain that none of the copper segments on the commutator are joined electrically by conducting materials such as copper, steel chips, or solder.

(*c*) *Field ring assembly* (24).

1. Touch the test lamp prods to the terminal ends of the field windings. If the test lamp lights, the circuit is complete.

2. Touch one test lamp prod to the terminal of the field winding and the other prod to the field ring. The lamp will light if the winding is grounded to the field ring or pole pieces.

3. Connect the terminals of the shunt field winding to 24 volts. A test ammeter should indicate 9.53 to 10.52 amperes. The total resistance of the field winding is 2.28 to 2.52 ohms. When a current of 50 amperes is passed through the interpole and compensating windings, a voltmeter connected across the leads should read 1.71 volts, plus or minus .1 volt. Con-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TM 919-28

Figure 28. D-c generator, exploded view.

nections for this test should be made to the two series leads fastened to the brush holders.

(*d*) *Capacitor cover* (4).

1. Examine the capacitor cover for cracks.

2. Examine the insulated terminal block and replace if cracked.

3. Examine the terminal studs and jumpers for burns or damage.

4. Replace damaged gaskets.

(*e*) *Bearing* (16, 17). Examine the bearings for pits, scratches, or binding.

(3) *Reassembly.* After cleaning and inspection, reassemble the d-c generator as follows:

LEGEND FOR FIGURE 28

1. Capacitor cover plate (H490).
2. Cover plate gasket (H489).
3. Commutator end cover (A46).
4. Capacitor cover (A43).
5. Cover gasket (H488).
6. Locknut (H481).
7. Washer (H482).
8. Pulley (O-142).
9. External fan (O-143).
10. Key (H483).
11. Bearing retainer (H487).
12. Drive end housing (A42).
13. Spanner nut (H484).
14. Tabbed lockwasher (H485).
15. Guard washer (H486).
16. Drive end bearing (O-144).
17. Commutator end bearing (O-145).
18. Armature assembly (E45).
19. Commutator end housing (A45).
20. Spring pin.
21. Brush spring (O-146 through O-151).
22. Brush (E47 through E52).
23. Brush rigging (A44).
24. Field ring assembly (E46).

(*a*) Install the brushes (22) in the brush holders and secure the leads. Secure the brush springs (21) with the spring pins (20) and cotter pins. Reassemble the cotter pins in the same notches to maintain correct spring pressure.

(*b*) Install the brush rigging (23) in the commutator end housing (19) and aline with the marks made in disassembly. Secure the rigging with four screws and the special lock nuts.

(*c*) Position the commutator end housing on the field ring (24), making sure that the field coil leads are fed through the three slots in the brush rigging. Position the housing in the correct location by mating the dowel pin on the field ring with the hole in the housing. Secure with the square-head screws.

(*d*) Slip the bearing retainer (11) on the drive end of the armature shaft and press the bearings (16, 17) in position. Slip the guard washer (15) and the tabbed lockwasher (14) on the shaft against the drive end bearing (16) and secure with the spanner nut (13).

(*e*) Tap the drive end housing (12) over the bearing and secure with the bearing retainer (11) and four screws.

(*f*) Slip the armature (18) into the field ring and tap the shaft until the bearing (17) is in place in the commutator end housing. Use care not to damage the brushes, and examine for correct seating on the commutator. Aline either mounting ear of the drive end housing with the ear on the commutator end housing and secure housing to the field ring with the socket-head screws.

(*g*) Position the capacitor cover gasket (5) and capacitor cover (4) on the field ring. Care should be taken to assure clean metal-to-metal contact between the field ring, gasket, and capacitor cover. Connect the jumpers to the brush rigging and interpoles. Connect the field lead to the jumper separator. Slip the commutator end cover (3) in position and secure the end cover and capacitor cover with the six screws. Then secure the cover plate gasket (2) and cover plate (1) to the capacitor cover.

(*h*) Position the key (10) in the shaft keyway and tap the assembled external fan (9) and pulley (8) onto the shaft. Lock the pulley into position with the locknut (6) and washer (7).

j. STARTING MOTOR (fig. 29). After the starting motor has been removed (par. 53*n*), proceed as follows:

(1) *Disassembly.*

(*a*) Remove the cotter pin (1) and slip out the link pin (2) connecting the yoke (18) to the solenoid switch. Then remove the solenoid switch and the connector strap.

(*b*) Remove the brush cover band (3) and take the screws (4) out of commutator end head assembly (10). Lift the brushes (6) out of the brush holders as shown in figure 30. Slip the commutator end head assembly out of the field frame (46).

(*c*) Remove the armature (25) from the frame by removing the screws (11), cotter pin (13), and yoke pin (14) from the pinion housing (17). Slip the armature assembly out of the frame. Remove the two screws (15) and remove the pinion housing. If necessary, tap the housing with a soft-faced hammer to facilitate removal.

(*d*) Drive the pinion stop and the retainer (19) down on the shaft (toward the spline) and remove the snap ring (20) from the groove. Slip the overrunning clutch (21) and the intermediate bearing assembly (22) from the shaft.

(2) *Cleaning and inspection.* Clean all the starting motor parts and inspect for abnormal conditions as instructed below.

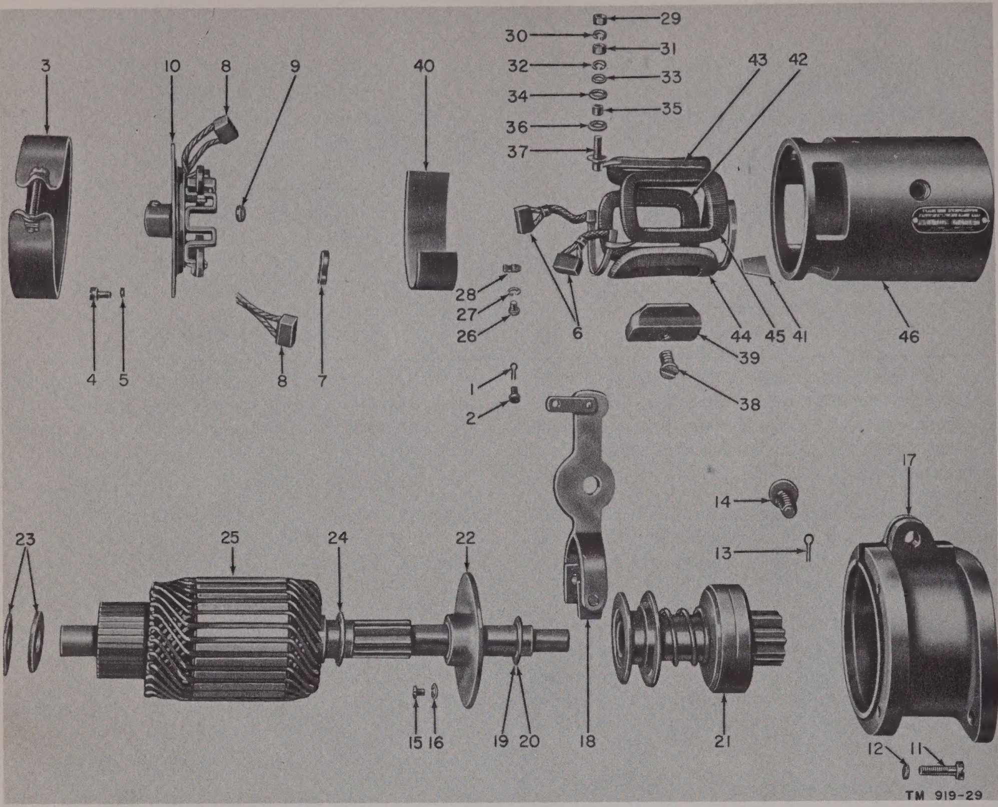

Figure 29. Starting motor, exploded view.

(*a*) *Brushes* (6, 8).

1. The brushes should slide freely in their holders and make full contact on the commutator. Worn brushes must be replaced.
2. To replace the brushes (8) which have leads connected to the brush holder, the terminal must be unclinched and unsoldered. The new brush leads must be tightly clinched in the terminal, and then soldered to make a strong, low-resistance connection. Brushes (6) which are soldered to the field coil must be unsoldered and the loop in the field coil lead must be opened. Insert the new brush pigtail to its full depth in the loop and then clinch before resoldering. A good soldering job must be done to insure no loss of efficiency because of poor contact.
3. To check the tension of the reaction-type brush springs (7), hook a scale under the brush spring near the brush and pull on a line parallel with the side of the brush, as shown in figure 31. Take the reading just as the spring leaves the brush. The brush spring tension should be between 2.6 and 3.2 pounds (42 to 53 ounces). If the brush spring tension is too low, a loss of efficiency will be caused by poor brush contact. If the tension is too great, the commutator and brushes will wear excessively and have short life. It is important, therefore, that the brush spring tension be kept within the specified limits. To change the spring tension, use long-nosed pliers and twist the spring at the holder.

LEGEND FOR FIGURE 29

1. Cotter pin.
2. Link pin.
3. Cover band (A37).
4. Screw.
5. Lockwasher.
6. Brush (E31, E32).
7. Brush spring (O-135 through O-138).
8. Ground brush (E33, E34).
9. Felt pad.
10. Commutator end head assembly (A36).
11. Screw.
12. Lockwasher.
13. Cotter pin.
14. Yoke pin (H451).
15. Screw.
16. Lockwasher.
17. Pinion housing (A35).
18. Yoke (H452).
19. Pinion stop and retainer (H449).
20. Snap ring (H448).
21. Overrunning clutch (O-133).
22. Intermediate bearing assembly (O-134).
23. Thrust washers.
24. Thrust arm washer.
25. Armature (E28).
26. Connector clamp screw.
27. Lockwasher.
28. Connector clamp.
29. Nut.
30. Lockwasher.
31. Nut.
32. Lockwasher.
33. Plain washer.
34. Insulating washer.
35. Insulating bushing.
36. Inner insulating washer.
37. Terminal stud.
38. Pole shoe screw.
39. Pole shoe.
40. Field connection insulation.
41. Field connection insulation.
42. Field coil.
43. Field coil.
44. Field coil.
45. Field coil.
46. Frame.

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4. Using test probes, touch each insulated brush holder with one probe, and a convenient ground on the commutator end plate with the other probe, as shown in figure 32. If the lamp lights, a ground is indicated and the brush holder must be replaced.

(*b*) *Armature* (25).

1. Check the commutator for wear or discoloration. If the commutator is only slightly dirty or discolored, it can be cleaned with #0000 sandpaper. Blow the sand out of the motor after cleaning the commutator. If the commutator is rough or worn, the armature should be removed and the commutator turned down in a lathe. Visually inspect the armature for mechanical defects.

2. Test the armature for grounds with a set of test probes. Touch one probe to a commutator segment and touch the core or the shaft with the other probe. Do not touch the points to the bearing surface or to the brush surface because the arc formed will burn the smooth finish. If the lamp lights, the coil connected to the commutator segment is grounded.

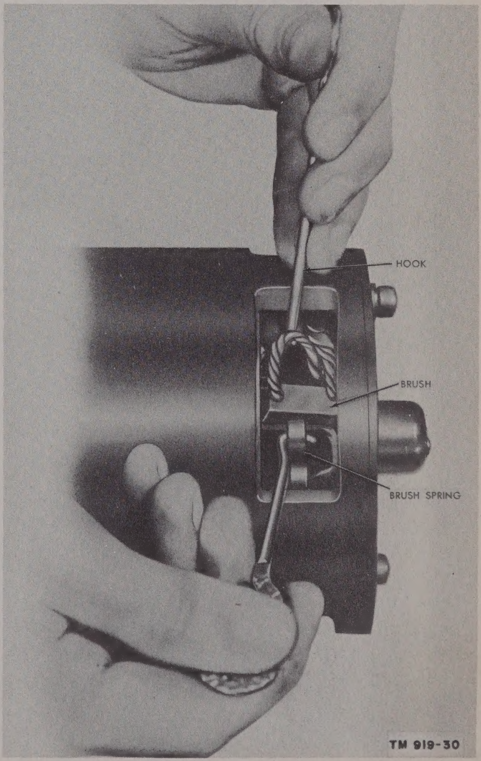


Figure 30. Removing brushes (starting motor).

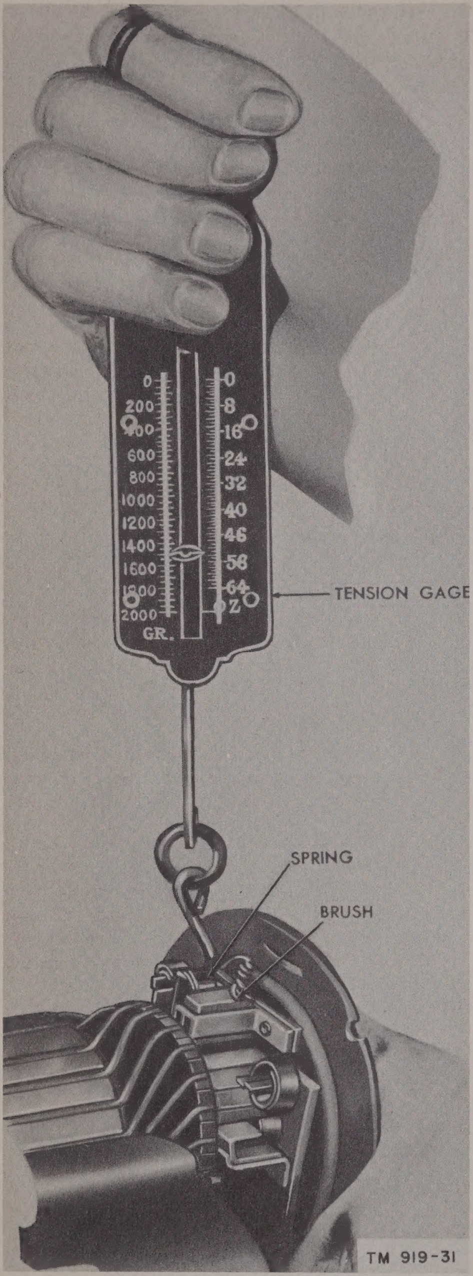


Figure 31. Measuring brush spring tension (starting motor).

3. To test for a shorted armature coil, place the armature against the core of a growler and hold a steel strip on the armature. Then rotate the armature slowly by hand. If a coil is shorted, the steel strip will become magnetized and vibrate.

(*c*) *Field coils* (42, 43, 44, 45).

1. Use test probes and check the field coils for grounds. Place one probe on the starting motor frame or pole piece and touch the other probe to the field coil terminals. If a ground is present, the lamp will light.

2. Inspect all connections to make sure they are properly clinched and soldered. Inspect the insulation for evidence of damage.

(*d*) *Pinion housing* (17). Inspect the housing for cracks and the bearings for wear.

(*e*) *Overrunning clutch* (21). Clean with Diesel oil (D-40 or D-35) and examine for wear.

(3) *Reassembly.* After cleaning and inspection, reassemble the starting motor as follows:

(*a*) Wipe the pinion end of the armature shaft with oil (OE 10). If the absorbent bronze bearings have been removed, soak them in oil (OE 10) before assembling in the bearing bore. Slip the intermediate bearing assembly (22) and overrunning clutch (21) on the armature shaft. Slip on the retainer and pinion stop (19) and secure with the snap ring (20).

(*b*) Hold the yoke (18) in position and secure the pinion housing (17) to the intermediate bearing assembly with the screws (15) and lockwasher (16). Secure the yoke to the pinion housing with the yoke pin (14) and cotter pin (13). Slip the frame (46) over the armature (25) and secure with the screws (11) and lockwashers (12).

(*c*) Apply a few drops of oil (OE 10) to the felt pad (9). If the absorbent bronze bearing has been removed, soak in oil (OE 10) and assemble, using correct size arbor to insure proper bearing fit. Secure the commutator end head assembly (10) to the frame with screws (4) and lockwashers (5). Proper brush seating should be insured by sanding the brush to fit the commutator. Wrap a strip of #0000 sandpaper around the commutator with abrasive side facing brushes. Turn the armature slowly in the direction of rotation. Blow the abrasive out of the motor after sanding. Secure cover band (3).

(*d*) Secure the solenoid switch to the frame. Attach the yoke (18) to the switch with the link pin

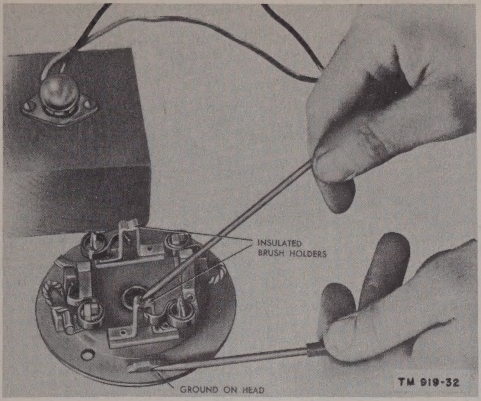


Figure 32. Testing brush holder for grounds (starting motor).

(2) and cotter pin (1). Secure the connector strap to the frame and switch. After installing the switch, press the switch plunger (not the yoke lever) to shift the pinion into the full mesh position. Adjust the clearance between the pinion stop from 3/32 inch to 1/16 inch by screwing the plunger link screw in or out as needed.

k. **HEATER** (fig. 33). After the heater has been removed (par. 53*o*(1)), proceed as follows:

(1) *Disassembly.*

(*a*) To remove the blower unit, disconnect the blower lead wire from the heater terminal block (35). Remove the mounting bracket screw (1) from the terminal block mounting plate (44). Remove the four screws (4) that secure the right half scroll (6). Loosen the setscrew (7) and slide the blower wheel (8) off of the blower motor shaft. Do not further disassemble the blower motor (9) as critical clearances are maintained between the motor and scroll assembly.

(*b*) Disconnect the wires from the electrode (11) and the resistor (13). Disengage the locking lever on the burner (18) by rotating the burner counterclockwise. The burner assembly will then drop out of the heater. Remove the electrode (11) by loosening the locknut (10). Remove the resistor (13) by turning it counterclockwise. Remove the cotter pins (15) and lift off the burner throat (16). Slip the igniter wick (17) upward over the igniter tube in the burner bowl.

(*c*) Disconnect the electrical leads on the flame switch (26) from the terminal block. Back off the switch mounting nut and remove the assembly from the top of the heater. Remove the adjusting screw (19) and the adjusting spring (20). Open the bracket on the bracket and tube assembly (27). The spring retainer (22) and spring (21) will fall out. Carefully remove the quartz rod (23); it is extremely brittle. Remove the mounting screws (24), lockwashers (25), and remove the switch.

(*d*) Disconnect the remaining wires on the terminal block (35). Remove the screws (28) and the receptacle (31). Then remove the screws (32) and the terminal block.

(*e*) Take off the heater top cover (38) by removing the screws (36). Loosen the heat exchanger (41) by removing the screws (39). Lift the heat exchanger out of the combustion chamber (47).

(2) *Cleaning and inspection.* Clean the carbon deposits from the burner, resistor, combustion chamber, throat, top cover, and flame switch rod. Blow out loose deposits with compressed air. Inspect all the heater parts for abnormal conditions as instructed below.

(*a*) After reassembly (subpar. (3) (*e*) below) check the blower assembly with a storage battery of 12 volts and a stroboscopic type of speed measuring instrument. If the blower wheel does not turn at least 5,000 rpm, replace the entire assembly.

(*b*) Inspect the air holes in the burner throat (16). If they are plugged, clean them with a pipe cleaner or wire. The igniter wick (17) should be replaced if charred or burned to a point 1/4 inch below the top edge of the igniter tube in the burner bowl (18).

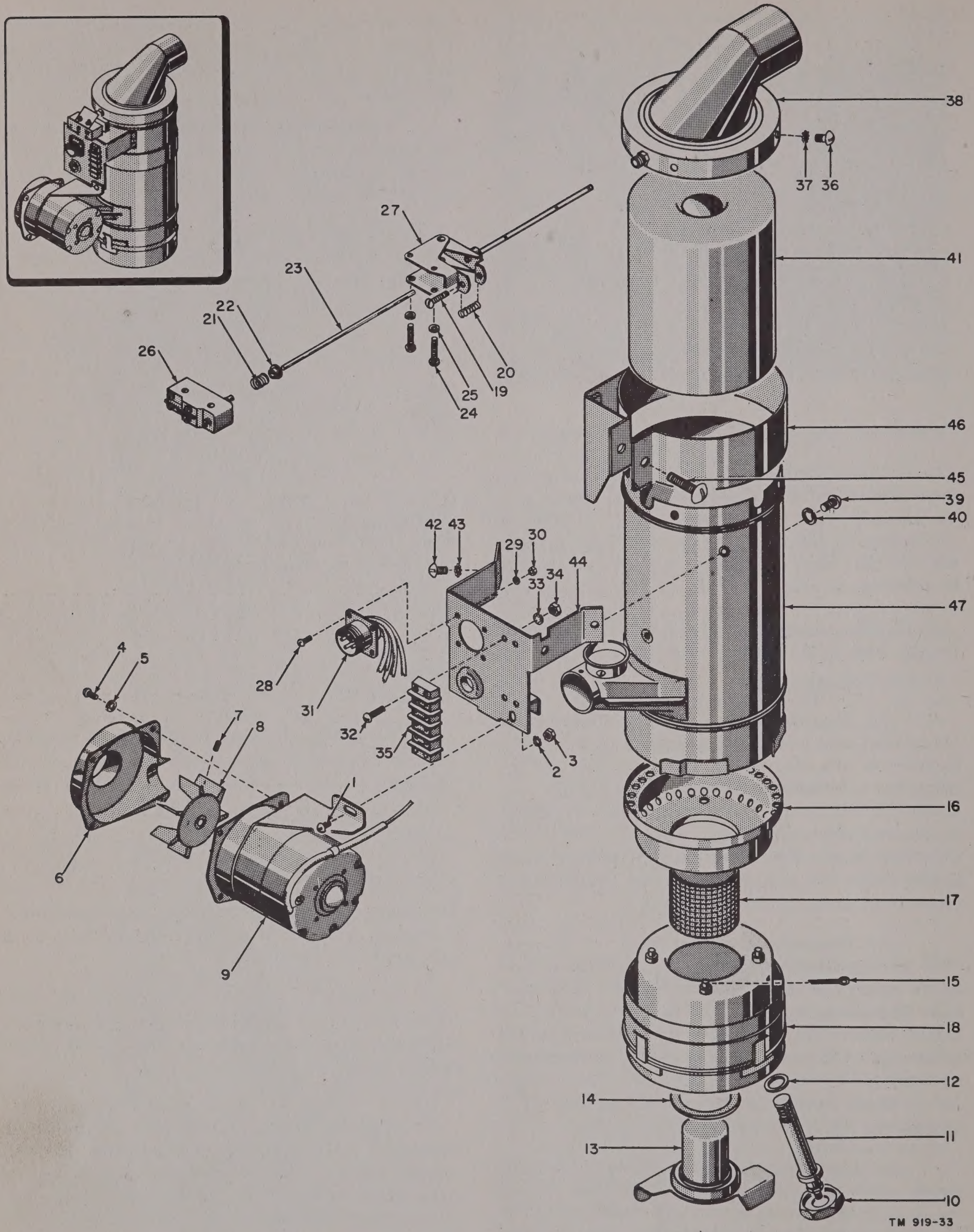
(*c*) Check the interior of the heat exchanger (41) for bulges or cracks. Examine the combustion chamber (47) and top cover (38) for dents and cracks.

(*d*) After reassembly (subpar. (3) (*c*) below) check the flame switch (26) operation by loosening the adjusting screw (19). Operate the switch manually by pressing the switch toward the heater and releasing. Check the continuity of circuits through the switch with a test lamp and prods or with an ohmmeter. Inspect the quartz rod (23) for breakage.

(*e*) Check the electrode (11) for proper operation as follows: Using a 6-volt battery, clamp the battery negative cable on the electrode terminal and the battery positive cable to ground. The electrode coil should turn cherry red immediately.

(*f*) To test the resistor (13), connect it in series with a good electrode. A resistor and electrode checked with 12 volts should draw 10 to 12 amperes from a good battery. If the combination does not draw 10 to 12 amperes, replace the resistor.

(3) *Reassembly.* After cleaning and inspection, reassemble the heater as follows: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TM 919-33

Figure 33. Heater, exploded view.

LEGEND FOR FIGURE 33

1. Screw.
2. Lockwasher.
3. Nut.
4. Screw.
5. Lockwasher.
6. Right half scroll (A45).
7. Setscrew.
8. Blower wheel (O-154).
9. Blower motor (B2).
10. Locknut (H516).
11. Electrode (E20).
12. Gasket (H515).
13. Resistor (R10).
14. Gasket (H514).
15. Cotter pin.
16. Burner throat (A55).
17. Igniter wick (H512).
18. Burner bowl (A57).
19. Adjusting screw.
20. Adjusting spring (O-153).
21. Spring (O-152).
22. Spring retainer (H509).
23. Quartz rod (H510).
24. Screw.
25. Lockwasher.
26. Flame switch (S9).
27. Bracket and tube assembly (A48).
28. Screw.
29. Lockwasher.
30. Nut.
31. Receptacle (J3).
32. Screw.
33. Lockwasher.
34. Nut.
35. Terminal block (TB10).
36. Screw.
37. Lockwasher.
38. Top cover (A49).
39. Screw.
40. Lockwasher.
41. Heat exchanger (A50).
42. Screw.
43. Lockwasher.
44. Terminal block mounting plate (A52).
45. Screw.
46. Heater mounting bracket (A51).
47. Combustion chamber (A53).

(*a*) Slip the heat exchanger (41) into the combustion chamber (47) and secure it with the screws (39) and lockwashers (40).

(*b*) Secure the receptacle (31) to the plate (44) with the screws (28), lockwashers (29), and nuts (30). Then secure the terminal block (35) with the screws (32), lockwashers (33), and nuts (34). Connect the wires as shown in figure 63.

(*c*) Secure the switch (26) with screws (24) and lockwashers (25). Insert the quartz rod (23) into the bracket and tube assembly (27). Slip the spring (21) and spring retainer (22) over the switch plunger. Close the bracket and position the adjusting spring (20). Secure the spring with the adjusting screw (19). Insert and secure the flame switch assembly in the top cover (38). Then install the top cover on the combustion chamber with the screws (36) and lockwashers (37). Connect the wires as shown in figure 63. Check the operation of the flame switch (subpar. (2) (*d*) above).

(d) Slip the igniter wick (17) over the igniter tube in the burner bowl (18). Secure the burner throat (16) to the burner bowl with the cotter pins (15). Position the gasket (14) over the resistor (13) and insert the resistor into the burner bowl. Position the gasket (12) on the electrode (11) and insert the electrode in the bowl. Be sure the index button on the electrode is inserted in the groove in the burner bowl. Install and tighten the locknut (10). Insert the assembled burner bowl in the combustion chamber and rotate it clockwise to secure it. Connect the resistor and electrode wires.

(*e*) Slide the blower wheel (8) on the blower motor shaft and fasten it with the setscrew (7). Secure the right half scroll (6) to the blower motor (9) with the screws (4) and lockwashers (5). Secure the motor ground strap to the scroll halves. Attach the assembly to the terminal block mounting plate (44) with the screw (1), lockwasher (2), and nut (3). Connect the blower motor wire to the terminal block. Check the operation of the blower assembly (subpar. (2) (*a*) above).

l. Heater Fuel Pump (fig. 34). After the heater fuel pump has been removed (par. 53*o*(3)), proceed as follows:

(1) *Disassembly.*

(*a*) Apply a wrench to the nut on the bottom of the cover and remove the cover. Then carefully remove the screen.

(*b*) Remove the three screws and lift out the spring cup, gasket, plunger spring, and plunger. Do not remove the buffer spring or valve assembly from the plunger. Do not remove the valve assembly from the spring cup.

(2) *Cleaning and inspection.* Clean all the heater fuel pump parts and inspect for abnormal conditions as instructed below.

(*a*) Clean the cover in solvent (SD) and blow dry with compressed air. Examine the cover for cracks or dents. Replace the cover gasket.

(*b*) Thoroughly clean the screen in solvent (SD). If the screen is badly distorted or collapsed, replace it.

(*c*) Clean the plunger and spring cup with solvent (SD). Do not use compressed air on these parts. Check the plunger fit by slowly raising and lowering the plunger in the cylinder. It should move freely without any tendency to stick. If the interrupter system is functioning properly, a click will be heard each time the plunger approaches the top of the cylinder.

(*d*) Flex the plunger spring and examine for cracks.

(*e*) Wash the pump body in solvent (SD) and blow out the cylinder with compressed air. Wipe the inside of the body dry with a piece of cloth.

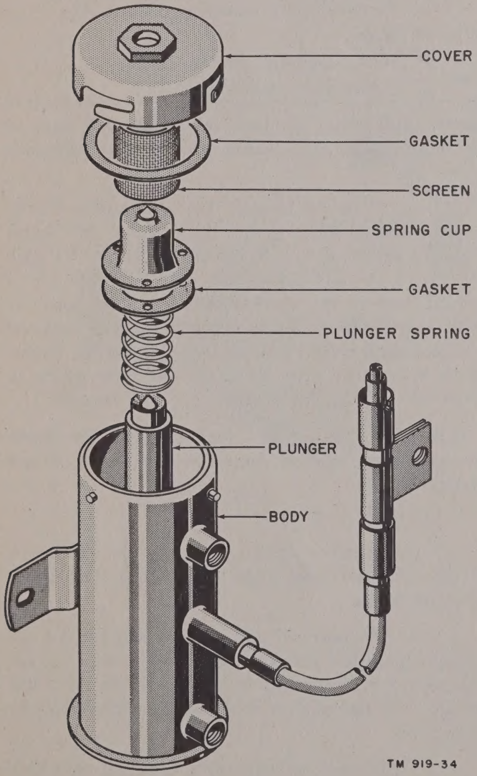

Figure 34. Heater fuel pump, exploded view.

(3) *Reassembly.* After cleaning and inspection, reassemble the heater fuel pump as follows:

(*a*) Insert the plunger in the cylinder with the buffer spring end first.

(*b*) Install the plunger spring over the plunger. Then install the spring cup gasket and the spring cup. Turn the fastening screws reasonably tight to insure a good seal, but avoid distorting the spring cup.

(*c*) Position the cover gasket in place. Seat the screen in the cover and then carefully guide the screen around the spring cup. Use a wrench to turn the cover to closed position.

m. D-C VOLTAGE REGULATOR (fig. 35). After the voltage regulator has been removed (par. 53*p*), proceed as follows:

(1) *Disassembly.*

(*a*) Remove the end cover by removing the attaching nuts and lockwashers.

(*b*) Carefully back off, but do not remove, the locknut on the contact screw to relieve the pressure on the carbon stack. Then remove the contact screw assembly.

(*c*) Insert a long narrow screw driver or rod the full length of the carbon stack and remove the carbon disks as a unit. Under normal conditions, the carbon stack must be discarded upon disassembly and replaced with a new stack. If the old stack is to be used again, extreme care must be taken during removal not to rotate the carbon disks with respect to each other. Do not handle the disks or disturb them in any way. Do not expose the stack to moisture, oil or gas fumes, or to a dusty atmosphere. Inclose them in a glass if possible.

(*d*) Remove the pile tube from the pile tube support.

(*e*) Remove the core cover. Then remove the end plate, core, and coil pot. Unsolder the coil leads from the base and remove the parallel and operating coils, pole piece, shims, aluminum spacer, bimetal ring, and the armature assembly. The armature assembly should not be disassembled, nor should any attempt be made to repair it.

(2) *Cleaning and inspection.* Clean all parts, except the carbon stack, with a clean, dry, lint-free cloth. Do not use gasoline or any solvent cleaner on coils, leads, insulators, resistors, adjusting screw contact, or armature contact. The carbon stack must not be touched in any way if it is to be used again. Inspect the parts as indicated below.

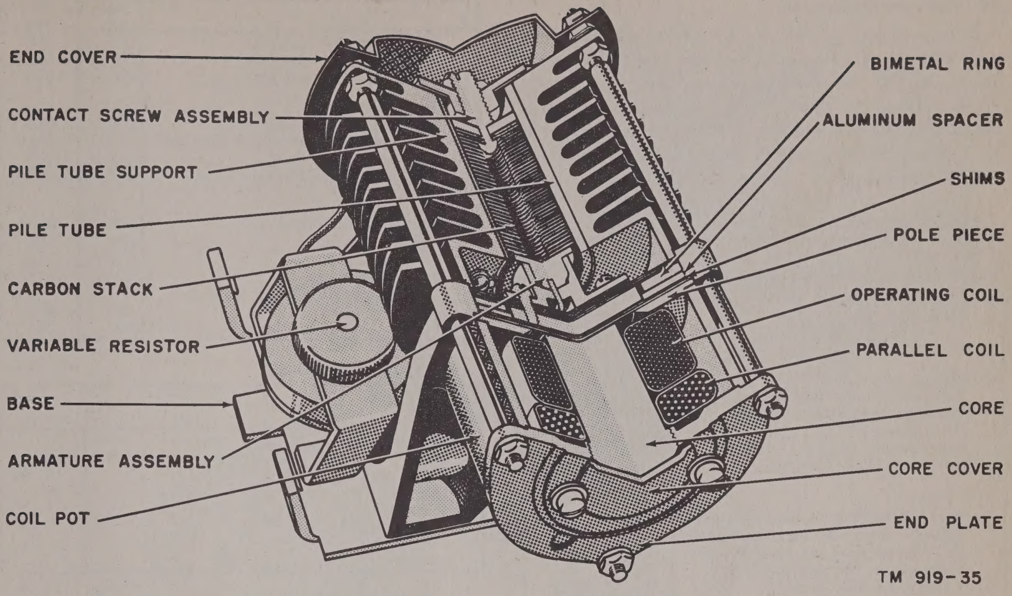

Figure 35. Voltage regulator, cutaway view.

(*a*) *General.* All insulation must be clean, dry, and in good mechanical condition. All screws, nuts, and lockwashers must be in good usable condition. The bimetal ring and aluminum spacer must not be bent or battered. Contact buttons must be clean, and soldered connections tight.

(*b*) *Armature assembly.* All screws holding the armature assembly together must be tight. If the spring leaves are rusted, bent out of shape, or broken, replace the assembly. The armature contact must not be greasy, dirty, chipped, or broken, and the connecting lead from the contact must be intact. A small amount of carbon dust on the contact may be removed by dry-wiping with a soft cloth. Otherwise, replace the armature assembly.

(*c*) *Contact screw assembly.* The adjusting screw contact must not be dirty, greasy, chipped, pitted, or broken. If the contact screw is not free to turn on the small screw passing through its center, or if the threads on the adjusting screw are worn or damaged, replace the assembly. A small amount of carbon dust may be removed by dry-wiping with a soft cloth.

(*d*) *Coils.* Examine the coils for electrical continuity with a test lamp, ohmmeter, or buzzer. Examine for frayed leads and broken or burned insulation.

(*e*) *Resistors.* Examine the resistors for continuity, broken leads or windings, damage to insulation, or burning. The variable resistor must make contact throughout its rotation. Make sure the spring clip locks the resistor knob in any given position.

(3) *Reassembly.* After cleaning and inspection, reassemble the voltage regulator as follows:

(*a*) Insert the armature assembly in place. Position the bimetal ring, aluminum spacer, shims, and pole piece over the armature assembly. Place the coil pot on the regulator and insert the operating coil and parallel coil in the pot. Insert the core and secure the end plate and core cover. Then solder the coil leads to the base.

(*b*) Insert the pile tube in the pile tube support. Insert a small rod through the center hole of the carbon stack and carefully slide the stack into the pile tube on the rod. Do not disturb the carbon disks in any way.

(*c*) Secure the contact screw assembly in position and tighten the nut on the screw to apply pressure to the carbon stack. Then secure the end cover.

(*d*) After reassembly and before the regulator can be operated, it must be adjusted as instructed in paragraph 62*b*.

55. Fits and Tolerances

This paragraph provides a table of fits and tolerances required to repair or overhaul Gasoline Engine Generator Set PU-107/U. The *min* and *max* columns in this paragraph indicate the minimum and maximum tolerances for parts to be continued in use. Parts not conforming to the limits specified should be replaced. The table of fits and tolerances follows:

a. CLEARANCES.

Item	Dimension (in.) min	max
1. *Engine bearings.*		
Main bearings.	.0014	.0029
Connecting rod bearings.	.0005	.0025
Camshaft bearings.	.001	.0025
2. *Pistons and rings.*		
Piston to cylinder wall clearance.	.003	.003
Piston pin clearance in piston.	.0001	.0009
Oil ring gap.	.008	.013
Compression ring gap.	.008	.013
Piston ring land clearance.	.0005	.0015
3. *Valves.*		
Intake valve stem clearance in guide.	.0015	.00325
Exhaust valve stem clearance in guide.	.0025	.0045
Valve tappet clearance (engine cold).	.016	.016
Valve tappet clearance in guide.	.0005	.002
Valve seat out-of-round.	.000	.002
4. *End play and backlash.*		
Crankshaft end play.	.004	.006
Camshaft end play.	.003	.0055
Main bearing side play.	.004	.008
Connecting rod side play.	.004	.010
Crankshaft gear to camshaft gear backlash.	.000	.002
Distributor shaft end play.	.003	.010
Distributor shaft side play.	.001	.005
Starter armature end play.	.005	.030
5. *Oil pump.*		
Clearance between rotor lobes.	.000	.010
Outer rotor and pump body clearance.	.000	.012
Gear clearance in body.	.003	.010
Inner surface of cover out-of-flat.	.000	.001
6. *Miscellaneous.*		
Cylinder out-of-round.	.000	.005
Flywheel runout.	.000	.008
Spark plug gap.	.030	.030
Breaker point gap.	.020	.020
Concentricity of flywheel housing with flywheel.	.000	.003
Face of flywheel housing with flywheel.	.000	.003

b. SPRING PRESSURES.

Item	Free length (in.)	Deflection or compression (in.)	Pounds
Valve springs.	2-1/2	Compressed to 2-7/64	53
		Compressed to 1-3/4	124
Governor control arm spring.	2-5/8	Deflected 1/4	38 - 46
		Deflected 1/2	70
D-c generator brush springs.		Deflected 1/2	1.3 - 2.2
Starting motor brush springs.			2.6 - 3.3

c. WRENCH TENSION.

Item	Foot pounds
Cylinder head nuts.	60 - 65
Intake and exhaust manifold nuts.	31 - 35
Main bearing cap screws.	65 - 70
Connecting rod nuts.	35 - 40
Oil pan bolts.	10 - 14
Flywheel nuts.	36 - 40

Section III. DISASSEMBLY

Note. The following instructions apply to disassembly of the engine and alternator after the unit has been stripped in accordance with instructions in paragraph 53.

56. Disassembly of Alternator
(fig. 36)

a. STATOR HOUSING AND STATOR.

(1) If the upper frame has not been removed, disconnect leads from the alternator as necessary.

(2) Refer to paragraph 53*p* and remove the voltage regulator as instructed.

(3) Remove the bolts (1) which secure the stator housing (16) to the flywheel housing.

(4) Remove the screen (8) from the housing.

(5) Remove the six bolts (9) from the inner row on the bearing cover plate (11). Screw the puller bolt (furnished with the unit) into the tapped hole in the center of the cover plate. Turn the bolt until the housing is about halfway off the rotor as shown in figure 37. Install the lifting eye (furnished with the unit) in the top of the housing. Hook a chain hoist in the lifting eye and carefully remove the housing.

(6) Test the stator in the housing for grounds with a high potential tester set at 1,500 volts. Test from phase to phase and from phase to ground. With an ohmmeter, test the stator coils for continuity. Nominal resistance should be .0245 ohms at 68° F.

(7) Remove the stator (15) from the housing by first removing the bearing cover plate and the lead covers (14). Then heat the outside of the housing and carefully pull the stator out of the housing.

Caution: Do not raise the temperature of the housing above 180° F.

b. BEARING AND LINER.

(1) If the stator housing has been removed, pull the bearing (17) and the liner (18) from the rotor shaft.

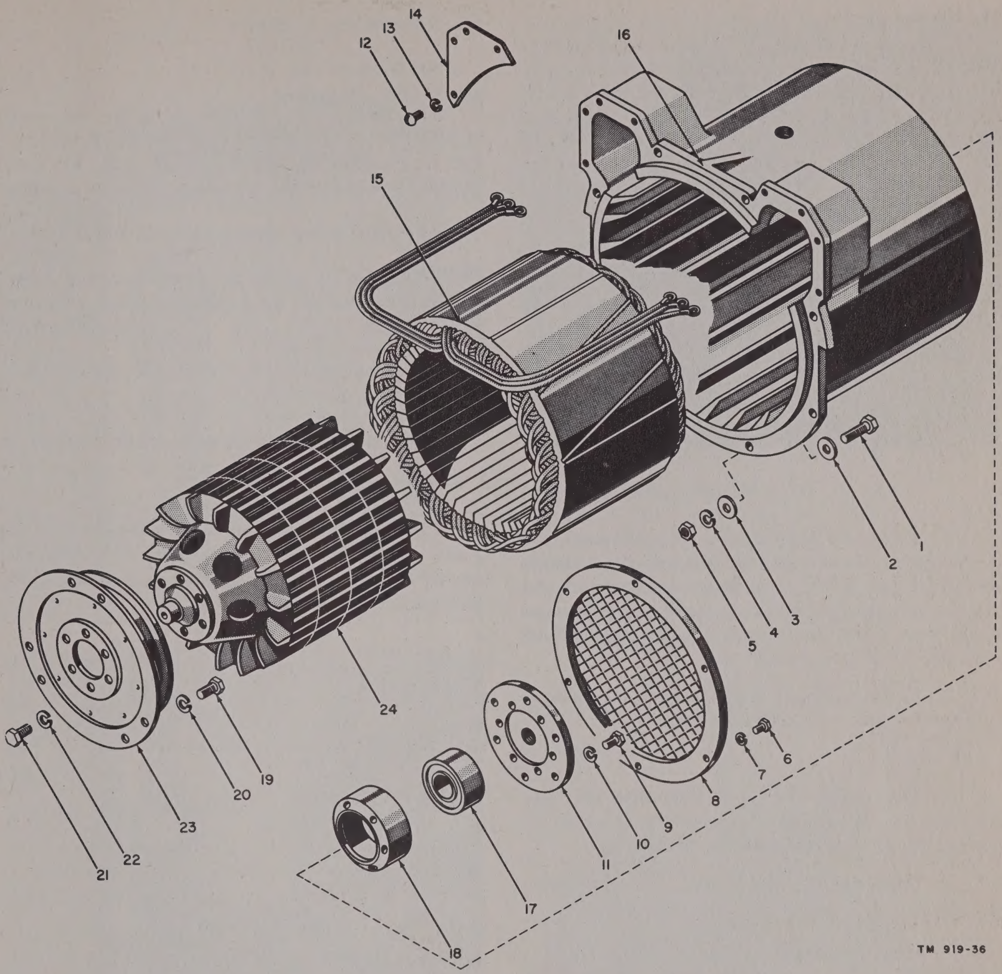
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Figure 36. Alternator, exploded view.

1. Bolt.
2. Flat washer.
3. Flat washer.
4. Lockwasher.
5. Nut.
6. Bolt.
7. Lockwasher.
8. Screen (A64).
9. Bolt.
10. Lockwasher.
11. Bearing cover plate (O-159).
12. Screw.
13. Lockwasher.
14. Stator lead cover (H542).
15. Stator (E56).
16. Stator housing (A63).
17. Bearing (O-158).
18. Bearing liner (O-157).
19. Bolt.
20. Lockwasher.
21. Bolt.
22. Lockwasher.
23. Rotor drive plate (O-156).
24. Rotor (E55).

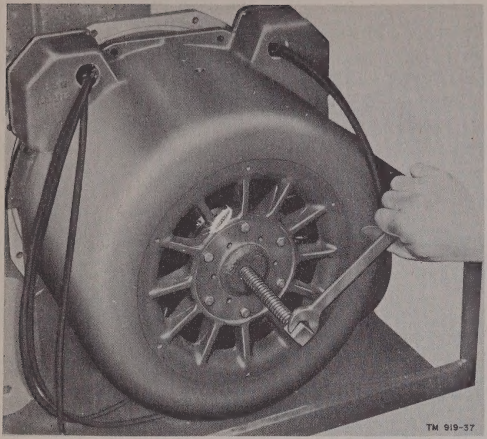

Figure 37. Removing stator housing.

(2) If the stator housing is in position on the unit, the bearing and the liner can be removed as follows: Remove the six bolts (9) from the outer row on the bearing cover plate and install the puller bolt in position in the plate. Turn the bolt until the bearing and the liner break loose from the rotor shaft.

(3) Check the bearing in the liner for binding. Examine the liner for scratches and burrs.

c. ROTOR.

(1) Place a canvas belt around the rotor (24) and attach the belt to a lifting hoist as shown in figure 38. Take up on the hoist until the belt becomes taut.

(2) Cut the lockwires and remove the bolts (19) which secure the rotor to the engine flywheel.

(3) Hoist the rotor away from the flywheel.

Note. Coupling of the rotor drive plate to the engine flywheel is shown in figure 39.

(4) Examine the rotor for scratches. If scratched, apply a thin coat of fungiproof lacquer to the surface. Check the rotor drive plate for cracks.

57. Removal of Engine

Before the engine can be removed, remove the muffler, radiator, and other subassemblies in accordance with pertinent instructions in paragraph 53. When the engine has been stripped of all subassemblies and components that would interfere with its removal, disconnect the two ground straps on the front engine mounts and remove the four engine mounting bolts. Hook a hoist to the engine lifting eyes and hoist the engine from the frame as shown in figure 40.

58. Disassembly of Engine

a. MANIFOLDS (fig. 41).

(1) Remove the bolts which secure the intake manifold (1) to the exhaust manifold (3). Remove the nuts which secure the intake manifold to the block and remove the manifold and the gasket.

(2) Remove the exhaust manifold and the gasket.

(3) Clean the carbon out of the manifolds with a wire brush. Blow out loose carbon deposits with compressed air.

(4) Scrape gasket particles off the manifold flanges.

(5) Examine the manifolds for cracks and warpage.

b. CYLINDER HEAD (fig. 41).

(1) Remove the coolant outlet elbow (5) and the gasket (6). Lift the thermostat retainer (7), thermostat adapter (8), and thermostat (9) out of the outlet elbow. Remove the spark plugs.

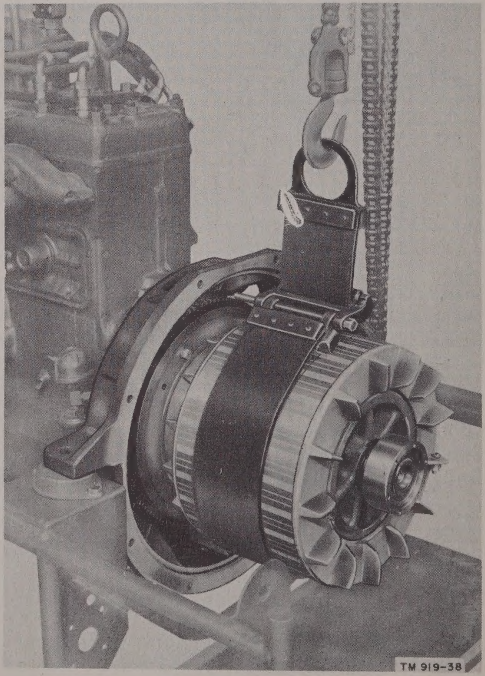

Figure 38. Removing rotor.

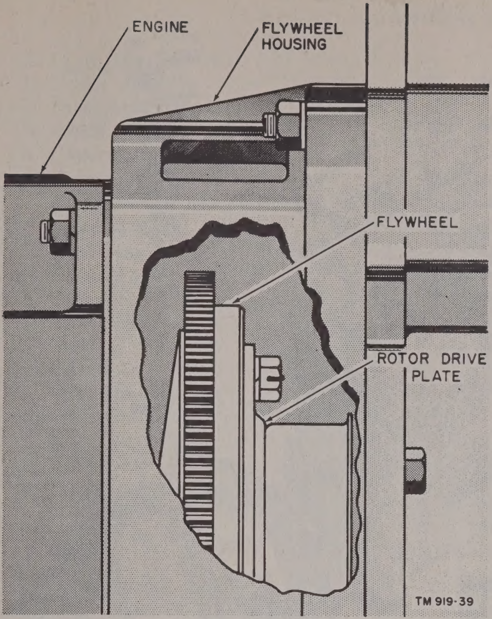

Figure 39. Engine-to-rotor coupling.

(2) Remove the hold-down nuts and pull the cylinder head (10) straight up off the studs. Remove the gasket (11).

(3) Wash the cylinder head with oil (D-40 or D-35) and scrape off gasket particles and carbon.

(4) Examine the cylinder head for dents, cracks, and warpage.

c. VALVE MECHANISM (fig. 41).

(1) Refer to subparagraph *a* above and remove the manifolds as instructed.

(2) Refer to subparagraph *b* above and remove the cylinder head as instructed.

(3) Remove the valve cover plate screws and valve cover plate (12) and the copper gaskets on each screw. Then block off the three holes in the valve chamber floor with cloth to prevent dropping valve locks into the crankcase.

(4) With a spring compressor, raise the springs on the valves in closed position, as shown in figure 42, and remove the valve locks (14). Then turn the crankshaft until open valves become closed and remove the remaining valve locks. Remove the valve rotocaps (17) and keep them with their respective valves.

(5) Remove the valves (15) and place them in a wooden block drilled and numbered for identification. Clean the valves on a wire wheel brush. Remove carbon from the top and bottom of the valve heads and the gum from the stems. Reface the valve heads at an angle of 45°. Reface the seats in the cylinder block and check with a dial gage. Valve seats should not be out-of-round more than .002 inch. Touch up the valves to the valve seats with a fine grinding compound.

(6) Check the clearance between the valve stems and valve guides (18). Standard clearance between the intake valve stem and valve guide is .0015 inch to .00325 inch; between the exhaust valve stem and valve guide the clearance should be .0025 inch to .0045 inch. If the clearance is excessive, remove the valve guides with a puller and discard them. If the clearance is standard, clean carbon off the valve guides with a wire brush.

(7) Wash the valve springs (16) in solvent (SD) and examine them for damage or corrosion due to acid etching. The over-all free length of each spring should be measured and the spring pressure checked. The free length should be 2-1/2 inches. The standard spring pressure when compressed to 2-7/64 inches is 53 pounds and when compressed to 1-3/4 inches is 124 pounds. Replace springs that do not meet the above specifications.

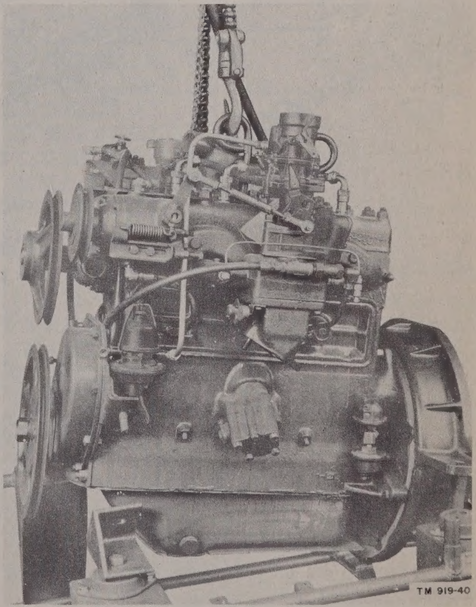

Figure 40. Removing engine from lower frame.

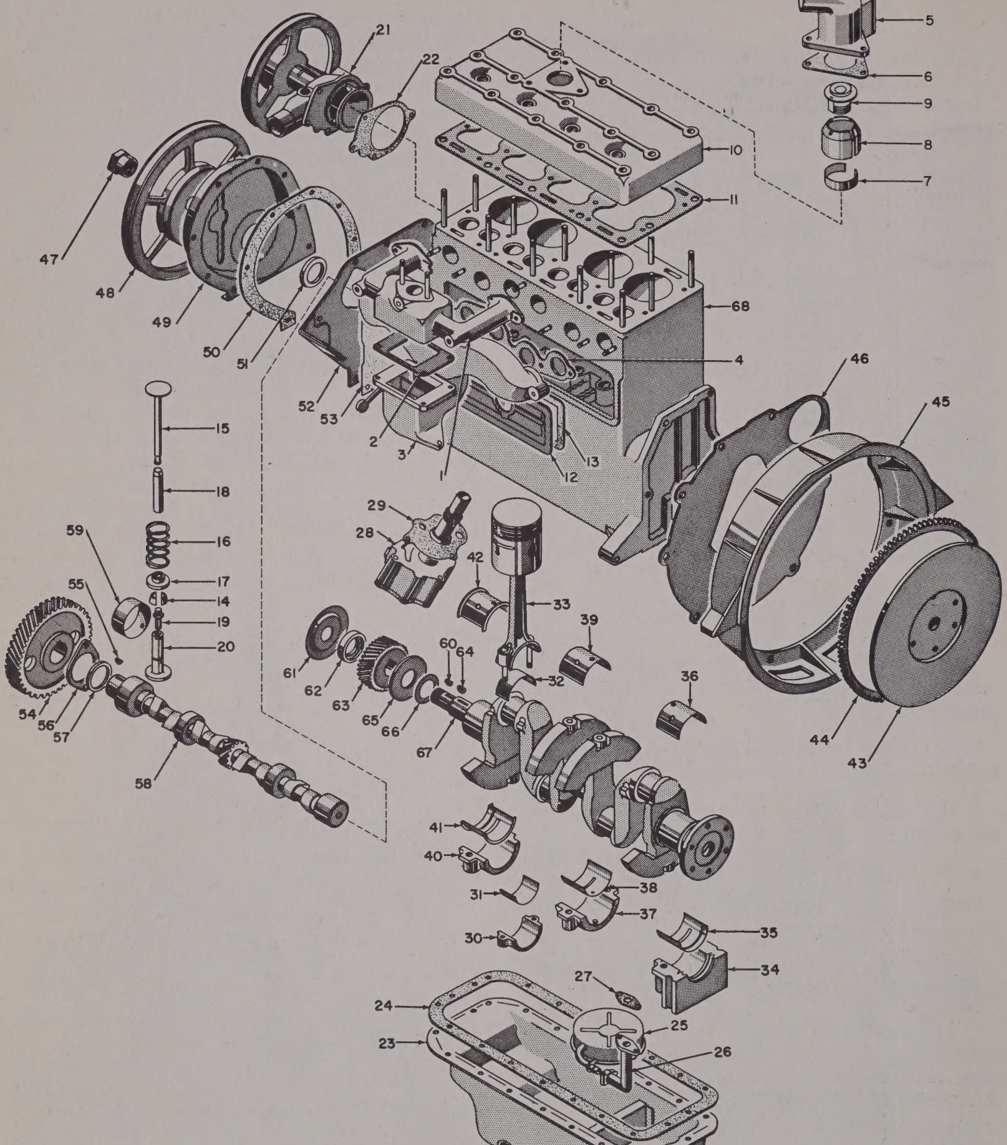
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Figure 41. Engine, exploded view.

LEGEND FOR FIGURE 41

1. Intake manifold (A9).
2. Gasket (H247).
3. Exhaust manifold (A10).
4. Gasket (H243).
5. Coolant outlet elbow (H4).
6. Gasket (H5).
7. Thermostat retainer (H10).
8. Thermostat adapter (H6).
9. Thermostat (O-1).
10. Cylinder head (A2).
11. Gasket (H38).
12. Valve cover plate (A11).
13. Gasket (H271).
14. Valve locks (H53 through H60).
15. Valve (O-3 through O-10).
16. Valve spring (O-19 through O-26).
17. Rotocap (O-27 through O-34).
18. Valve guide (O-11 through O-18).
19. Tappet adjusting screw (H61 through H68).
20. Valve tappet (O-35 through O-42).
21. Water pump assembly (O-81).
22. Gasket (H281).
23. Oil pan (A4).
24. Gasket (H122).
25. Oil float (O-69).
26. Oil float support (H158).
27. Gasket (H150).
28. Oil pump (O-82).
29. Gasket (H293).
30. Connecting rod cap.
31. Lower connecting rod bearing (O-60 through O-63).
32. Upper connecting rod bearing (O-60 through O-63).
33. Piston and connecting rod assembly.
34. Rear main bearing cap.
35. Lower rear main bearing (O-65).
36. Upper rear main bearing (O-65).
37. Center main bearing cap.
38. Lower center main bearing (O-64).
39. Upper center main bearing (O-64).
40. Front main bearing cap.
41. Lower front main bearing (O-59).
42. Upper front main bearing (O-59).
43. Flywheel (O-71).
44. Flywheel ring gear (O-72).
45. Flywheel housing (A62).
46. Rear engine plate (A8).
47. Crank ratchet (H174).
48. Crankshaft pulley (O-70).
49. Gear cover (A6).
50. Gasket (H193).
51. Oil seal (H192).
52. Front engine plate (A7).
53. Gasket (H201).
54. Camshaft gear (O-45).
55. Camshaft gear key (H69).
56. Thrust plate (H77).
57. Thrust plate spacer (H78).
58. Camshaft (O-44).
59. Camshaft bearing (O-43).
60. Crankshaft pulley key (H160).
61. Oil slinger (O-66).
62. Gear spacer (H103).
63. Crankshaft gear (O-67).
64. Crankshaft gear key (H101).
65. Thrust washer (H104).
66. Shim (H102).
67. Crankshaft (O-68).
68. Cylinder block (A3).

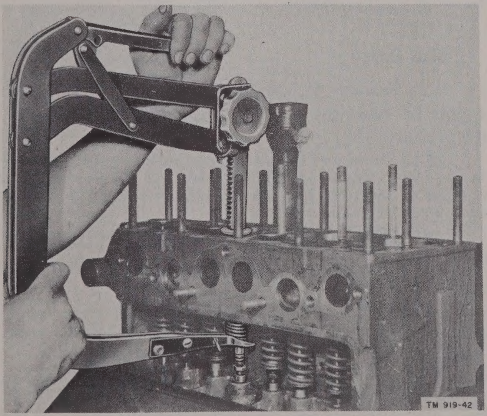


Figure 42. Removing valves.

d. Water Pump.

(1) Remove the fan from the water pump pulley.

(2) Remove the attaching bolts and lift the water pump assembly (21, fig. 41) from the block. Collect the gasket (22).

(3) Press the shaft (9, fig. 43) through the impeller (1) and the pump body (2). Remove the seal washer (3) and the seal (4). Then press the shaft from the pulley (5).

(4) Press the bearings (6, 8) from the shaft and collect the sleeve (7).

(5) Examine the seal washer seat in the pump body and reface if rough.

(6) Examine the seal for brittleness and cracks.

(7) Examine the bearings for binding and the shaft for scuff marks and scratches.

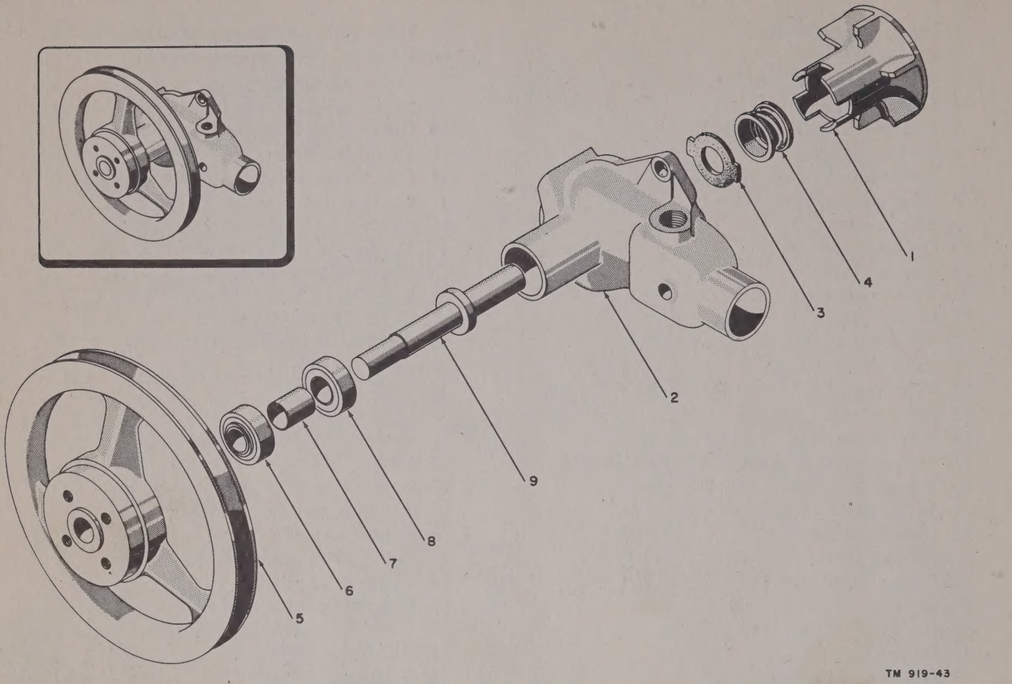


Figure 43. Water pump, exploded view.

1. Impeller (O-79).
2. Pump body (A12).
3. Seal washer (H279).
4. Seal (H280).
5. Fan and water pump pulley (O-141).
6. Bearing (O-164).
7. Sleeve (O-165).
8. Bearing (O-163).
9. Shaft (O-80).

e. OIL PAN (fig. 41).

(1) Remove the oil pan (23) by removing the bolts and lockwashers. Remove the oil pan gasket (24).

(2) Remove the cotter pin which secures the oil float (25) to the oil float support (26). Remove the oil float support by removing the bolts and lockwashers. Remove the gasket (27).

(3) Clean the oil pan with oil (D-40 or D-35) and examine it for dents and cracks. Scrape gasket particles from the flange surface.

(4) Wash the float, screen, and support tube with oil (D-40 or D-35) and remove any accumulation of dirt. Be sure the float support flange is flat and clean. Discard the oil float support gasket.

f. OIL PUMP.

(1) Remove the oil pump (28, fig. 41) from the engine by removing the three mounting bolts. Remove the gasket (29).

Note. To remove the oil pump with the igniter assembly in the block, remove the igniter cover and cap and note the position of the rotor in order to reinstall the pump without disturbing the ignition timing.

(2) Remove the gear (2, fig. 44) by filing off one end of the pin (1). Then drive the pin out with a small punch. Remove the bolts (3), the cover (5), and the gasket (6). The outer rotor (8) and inner rotor and shaft (7) can now be removed through the cover opening.

(3) Match the rotors together with one lobe of the inner rotor pushed completely into the notch of the outer rotor. Measure the clearance between the lobes as

shown in figure 45. If this clearance is more than .010 inch, replace both rotors.

(4) Measure the clearance between the outer rotor and the pump body as shown in figure 46. If the clearance exceeds .012 inch, the pump body is faulty and should be replaced.

(5) Examine the inner surface of the cover for scoring or scratches. Check flatness of the cover as shown in figure 47. It must be flat within .001 inch. The thickness of the rotors must be within .001 inch of each other. Assemble the rotors in the pump body and install the cover without the gasket. Tighten the cover screws to normal tension. It should now be impossible to turn the pump shaft by hand. Remove the cover and replace it with the gasket in position. The rotors should now turn with ease, proving that the end float of the rotors is less than the gasket thickness, or .004 inch.

g. Connecting Rods and Pistons (fig. 41).

(1) Refer to subparagraph *b* above and remove the cylinder head as instructed.

(2) Refer to subparagraph *e* above and remove the oil pan as instructed.

(3) Turn the crankshaft until the lower end of the desired connecting rod is accessible.

(4) Remove the locknuts and nuts from the connecting rod cap (30). Loosen the cap from the rod by tapping the cap with a soft hammer. Then remove the cap and lower bearing (31).

(5) Push the rod away from the crankshaft journal and remove the upper bearing (32).

(6) Using a ridge reamer, remove the carbon deposit from around the top of the cylinder bore. Keep the

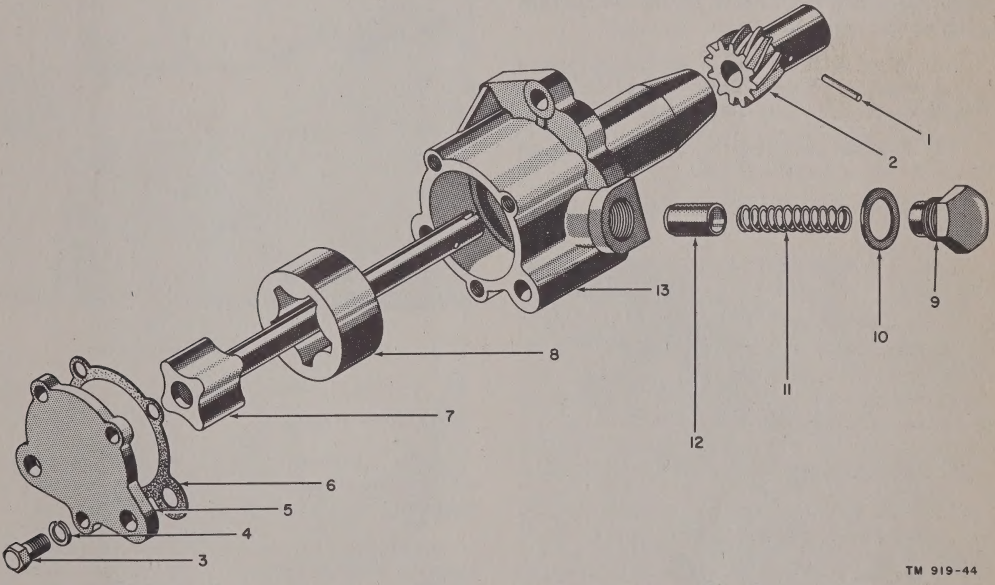


Figure 44. Oil pump, exploded view.

1. Gear retaining pin.
2. Driven gear.
3. Bolt.
4. Lockwasher.
5. Cover.
6. Cover gasket.
7. Inner rotor and shaft.
8. Outer rotor.
9. Relief valve retainer (H297).
10. Gasket (H296).
11. Spring (O-84).
12. Plunger (O-83).
13. Pump body.

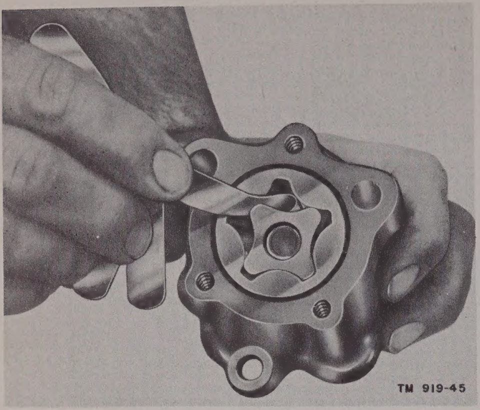


Figure 45. Checking oil pump rotors.

piston tops covered with cloth to prevent cuttings from falling into the engine.

(7) Wrap the lower end of the rod in cloth to prevent scratching of the cylinder wall as the rod is being removed.

(8) Push the connecting rod and piston (33) out through the top of the cylinder bore.

(9) Repeat the steps given in subparagraph (1) through (8) above for all the connecting rods and pistons.

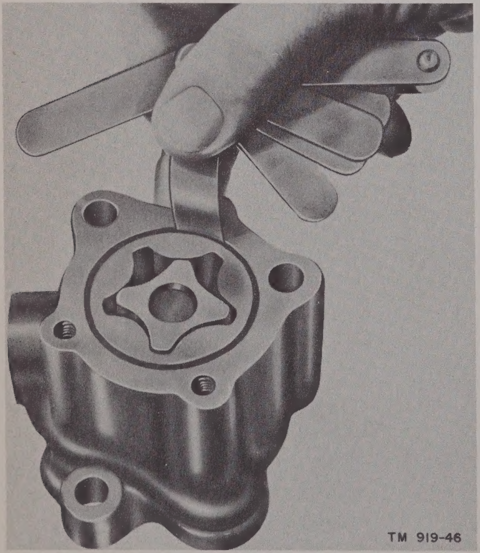


Figure 46. Checking clearance between outer rotor and oil pump body.

Caution: Connecting rods and caps are matched and must be paired together to insure correct reinstallation. Caps and rods are marked with their respective cylinder numbers.

(10) Remove the piston rings with a conventional ring remover.

(11) Remove the piston from the connecting rod by first removing the lockscrew. Then tap the piston pin from the piston and connecting rod.

(12) Refer to paragraph 59*g*(6) and check the connecting rod bearing clearance and side clearance as instructed.

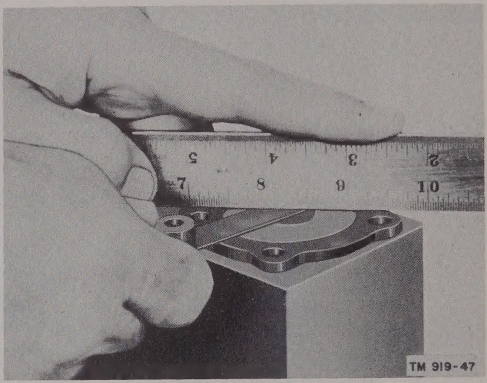


Figure 47. Checking oil pump cover.

(13) Check the connecting rod on an alining fixture as shown in figure 48.

(14) Examine the bearing for chipping, scoring, and cracking. Examine the back of the bearings for bright spots, which indicate a loose fit in the caps.

(15) Clean the bearings and caps with oil (D-40 or D-35) or solvent (SD).

(16) Measure the clearance between the piston and cylinder wall as follows: Insert an inverted piston into the cylinder. Then measure the clearance with a .003-inch, 3/4-inch wide feeler gage as shown in figure 49. This should give a 5-pound to 10-pound pull when being removed. (The gage should extend the full length of the piston on the thrust side, opposite slot.)

(17) Scrape the carbon from the ring grooves and soak the pistons in solvent (SD). After soaking, clean the grooves again to be sure all carbon has been removed.

Note. A groove is located between the top of the piston and the top ring groove. This groove retards the flow of heat and should not be cleaned of carbon deposits because the accumulated carbon acts as an insulator.

h. MAIN BEARINGS (fig. 41).

(1) Refer to subparagraph *e* above and remove the oil pan as instructed.

(2) Remove the cap screws and lockwashers which secure the main bearing cap (34) to the block. Remove the bearing cap. Then remove the lower bearing (35) from the cap. Repeat the above steps for the other two main bearings.

(3) Refer to subparagraph *m* below and remove the upper main bearings as instructed.

(4) Clean the main bearings and the caps with oil (D-40 or D-35) or solvent (SD).

(5) Examine the bearings for chipping, scoring, and cracking. Examine the back of the bearings for bright spots, which indicate a loose fit in the caps.

(6) Refer to paragraph 59*a*(6) and check the bearing clearance as instructed.

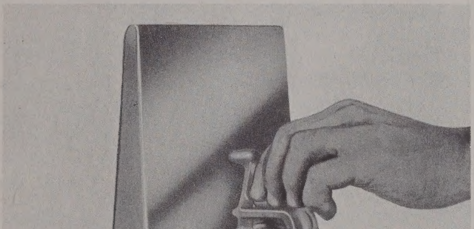


Figure 48. Alining connecting rod.

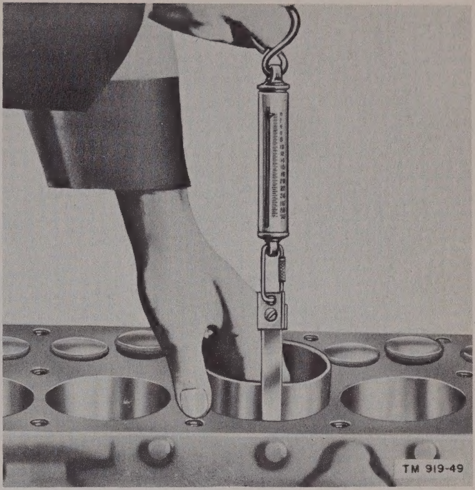


Figure 49. Checking piston clearance.

i. FLYWHEEL (fig. 41).

(1) Remove the nuts and lockwashers which secure the flywheel (43) to the crankshaft. Remove the flywheel.

(2) Examine the flywheel for nicks or burrs that may prevent even seating on the crankshaft flange. Examine the ring gear (44) for chipped or worn teeth.

(3) To remove the ring gear from the flywheel housing, heat the gear and tap it off with a hammer.

j. FLYWHEEL HOUSING (fig. 41). Because the flywheel housing (45) must be alined perfectly when installed, do not remove it unless it is damaged enough to require replacement. If removal is necessary, remove the bolts and lockwashers which secure the flywheel housing to the block and remove the housing.

k. GEAR COVER (fig. 41).

(1) Remove the crank ratchet (47) from the crankshaft. Remove the crankshaft pulley (48) with a puller as shown in figure 50. Remove the key (60).

(2) Remove the nuts, bolts, and lockwashers which secure the gear cover (49) to the engine. Remove the gasket (50). Then pull the oil seal (51) out of the gear cover.

(3) Slip the oil slinger (61) and the crankshaft gear spacer (62) off the crankshaft (67).

(4) Wash all parts in oil (D-40 or D-35) or solvent (SD).

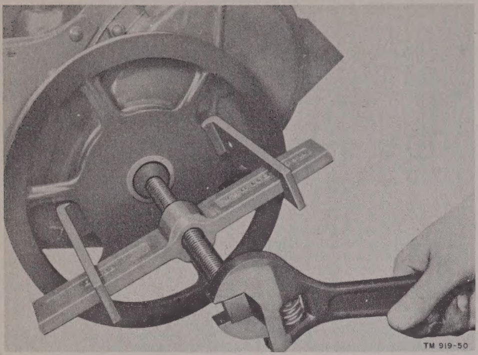


Figure 50. Removing crankshaft pulley.

(5) Examine the gear cover for cracks.

(6) Examine the oil seal for evidence of leakage, nicks, and burrs.

l. CAMSHAFT (fig. 41).

(1) Refer to subparagraph *a* above and remove the manifolds as instructed.

(2) Refer to subparagraph *b* above and remove the cylinder head as instructed.

(3) Refer to subparagraph *c* above and remove the valve mechanism as instructed.

(4) Refer to subparagraph *e* above and remove the oil pan as instructed.

(5) Refer to subparagraph *f* above and remove the oil pump as instructed.

(6) Refer to subparagraph *k* above and remove the gear cover as instructed.

(7) Remove the bolt, lockwasher, and gear washer which secure the camshaft gear (54) to the camshaft (58). Then pull the camshaft gear from the camshaft with a puller. Remove the key (55).

(8) Remove the thrust plate (56) and slip the thrust plate spacer (57) off the camshaft.

(9) Tie the valve tappets (20) up at their highest point of travel with strings tied around the adjusting screws (19) and the manifold studs.

(10) Pull the camshaft forward, out of the block. Then remove the tappets.

(11) Clean the camshaft and the tappets with oil (D-40 or D-35) or solvent (SD).

(12) Carefully examine the camshaft for scores and roughness on the cam and bearing surfaces. Check the oil pump drive gear for chipped or worn teeth. Measure the camshaft bearing clearance with a feeler gage. Standard bearing clearance is .001 inch to .0025 inch. If the bearing (59) is worn, drive it out with a drift.

(13) Examine the tappet faces and replace any that are scored, rough, or cracked. Standard clearance of the tappets in the guides is .0005 inch to .002 inch. Check and replace those that have worn excessively.

(14) Examine the camshaft thrust plate for rough edges, nicks, and burrs.

(15) Examine the camshaft gear for chipped and worn teeth.

m. CRANKSHAFT (fig. 41).

(1) Refer to subparagraph *e* above and remove the oil pan as instructed.

(2) Refer to subparagraph *g* above and remove the connecting rod caps as instructed.

(3) Refer to subparagraph *h* above and remove the lower main bearings as instructed.

(4) Refer to subparagraph *i* above and remove the flywheel as instructed.

(5) Refer to subparagraph *k* above and remove the gear cover as instructed.

(6) Then lift the crankshaft (67) out of the block.

(7) Remove the upper main bearings (36, 39, and 42). Refer to subparagraph *h* above and clean and inspect the bearings as instructed.

(8) Remove the crankshaft gear (63) with a puller. Remove the key (64). Slip the thrust washer (65) and shim (66) off the crankshaft.

(9) If it is necessary to install new bearings, use a micrometer to determine if the crankshaft journals are out-of-round. If the journals are out-of-round, in excess of the standard connecting rod or main bearing clearance, regrind the shaft and install undersize bearings.

(10) Clean the crankshaft with oil (D-40 or D-35) or solvent (SD). Use a rifle brush and clean the oil passages in the shaft and the crankcase. Blow out with compressed air.

(11) Examine the crankshaft journals for cracks and score marks.

(12) Examine the crankshaft for misalinement.

(13) Examine the crankshaft gear for chipped or worn teeth.

n. CYLINDER BLOCK.

(1) Clean sludge out of the block with oil (D-40 or D-35) or solvent (SD).

(2) Remove the pipe plug and clean out the oil passage in the block with a rifle brush.

(3) Scrape carbon off the top of the block.

(4) Examine the block for cracks.

(5) Check the cylinder bores with a dial gage. If the cylinders are more than .005 inch out-of-true, rebore them within .002 inch of the size desired. Finish and polish cylinders with a cylinder hone.

Section IV. REASSEMBLY

Note. This section provides complete instructions necessary to reassemble generator set PU-107/U. Instructions are included for reassembly of the engine and alternator; details are also given for installation of those subassemblies removed in paragraph 53. The unit can be rewired completely by referring to the appropriate wiring diagrams.

59. Reassembly of Engine

a. CRANKSHAFT AND MAIN BEARINGS (fig. 41).

(1) Slip the shim (66) and the thrust washer (65) onto the crankshaft (67). Be sure the side of the thrust washer with the inner beveled edge faces the front bearing. Insert the key (64) in the crankshaft groove and press the gear (63) onto the shaft.

(2) Place the upper main bearings (36, 39, and 42) over the dowels in the block. If necessary, install new packing in the block. The same procedure should be followed when installing this packing as when installing packing in the rear main bearing cap (subparagraph (5) below).

(3) Apply clean oil (OE) to the main bearing crankshaft journals. Then install the crankshaft in the block.

(4) Install the lower main bearings (35, 38, and 41) on the crankshaft.

(5) Install new packing in the rear main bearing cap as follows: Insert the packing in the groove of the cap. Roll the packing into the groove with a round piece of wood or steel as shown in figure 51. Start at one end and roll the packing to the center of the groove. Then start from the other end and again roll towards the center. Be sure the packing is pressed firmly into the bottom of the groove. The small portion of packing which protrudes above the surface of the cap at each end must be cut off flush.

(6) Check the clearance between the bearing and crankshaft journal as follows: Place a .002-inch shim between the journal and the bearing. Tighten the cap screws to the recommended torque of 65 to 70 pounds. A slight drag of the shaft, when turned by hand, proves the clearance (.002 inch to .0025 inch) is correct. Be sure to remove the shim.

(7) Reinstall the bearings and caps. Place liquid gasket sealer on the sides and face of the rear main bearing cap.

(8) Check the end play of the crankshaft with a feeler gage as shown in figure 52. Clearance should be between .004 inch and .006 inch. To adjust the end play, remove the crankshaft gear and thrust washer and insert shims as required between the thrust washer and the face of the front main bearing.

(9) Insert rubber packings in the block as shown in figure 53. The packings will protrude approximately 1/4 inch from the block. When the oil pan is installed, it will force the packing tightly into the holes.

(10) When installing a new crankshaft or flywheel, replace the tapered dowel bolts with straight bolts furnished with these parts. Assemble the crankshaft and flywheel in proper relationship. Then install the straight bolts and tighten them securely. Next use a 35/64-inch drill to enlarge the tapered holes. Ream the holes with

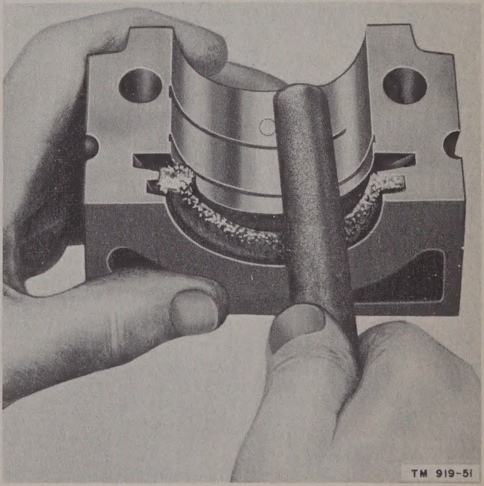


Figure 51. Installing rear main bearing packing.

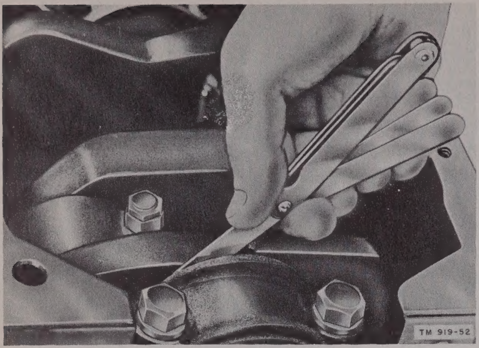


Figure 52. Checking crankshaft end play.

a 9/16-inch straight reamer and install the two special flywheel bolts instead of the tapered dowel bolts formerly used.

b. FLYWHEEL (fig. 41).

(1) Heat the ring gear (44) and install it on the flywheel (43) by tapping it lightly. Be sure the gear is seated properly.

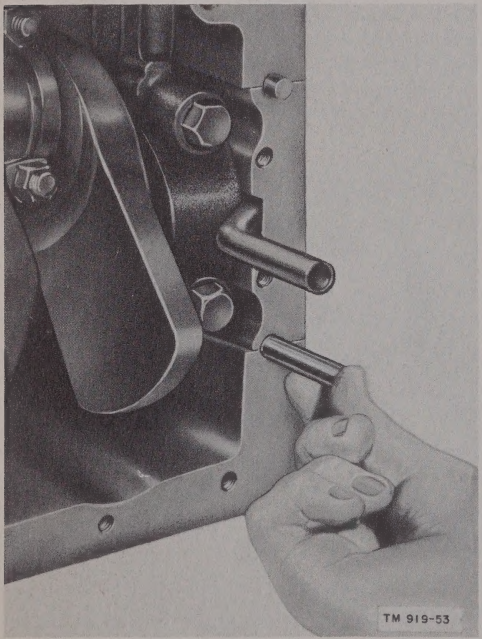


Figure 53. Installing rear main bearing cap packing.

(2) Install the rear engine plate (46) to the block.

(3) Turn the crankshaft until the arrow stamped on the flywheel and the arrow stamped on the crankshaft flange are alined. This correctly locates the TC timing mark in relation to the No. 1 crank throw.

(4) Install the flywheel on the crankshaft and progressively tighten the attaching nuts with a torque wrench to a tension of 36 to 40 pounds.

Note. If a new flywheel is being installed, refer to subparagraph *a*(10) above and proceed as instructed.

(5) After installation, check the run-out of the flywheel with a dial indicator. It should not exceed .008 inch on the outer edge of the flywheel rear face.

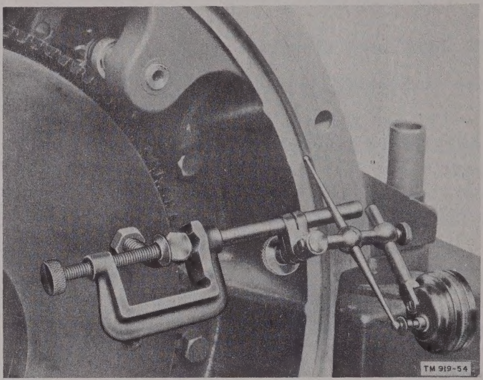


Figure 54. Checking concentricity of flywheel housing with flywheel.

c. FLYWHEEL HOUSING (fig. 41).

(1) Secure the flywheel housing (45) to the block.

(2) Loosen the bolts and check the concentricity of the flywheel housing bore with the flywheel as follows: Position a dial indicator on the flywheel as shown in figure 54. Turn the crankshaft slowly and observe the reading on the indicator. Shift the flywheel housing until centered within a tolerance of .003 inch. Then tighten the bolts. Recheck the concentricity after tightening.

(3) Check the face of the flywheel housing with a dial indicator as shown in figure 55. The housing should be parallel to the flywheel face within .003 inch. If the housing is not parallel, place shims between the engine block and the flywheel housing. Then recheck until the desired reading is reached. Be sure to tighten the bolts before each recheck.

Caution: It is essential that the above steps be taken when installing the flywheel housing. If the tolerances

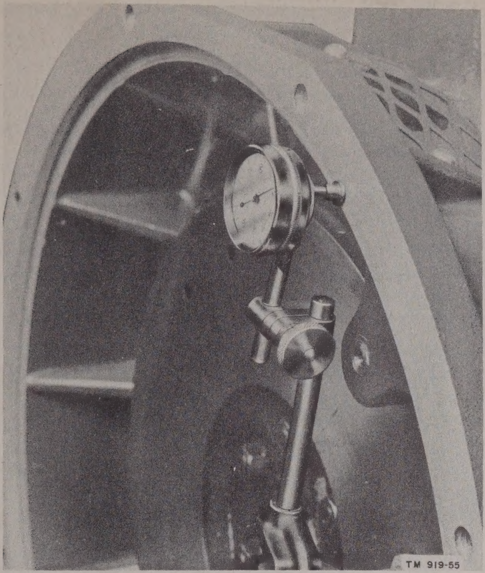


Figure 55. Checking face of flywheel housing with flywheel.

are greater than those specified, the resultant strain on the alternator bearing will cause serious damage to the rotor.

d. CAMSHAFT (fig. 41).

(1) Press the camshaft bearing (59) into the block and stake it in place as shown in figure 56.

(2) Install the valve tappets (20) and tie them with the string attached to the manifold studs. Refer to paragraph 58*l*(13) and check the tappet clearance in the guides as instructed.

(3) Install the camshaft (58) in the block and check the bearing clearance as instructed in paragraph 58*l*(12). Then slip the thrust plate spacer (57) on the camshaft with the beveled inner edge toward the rear and secure the shaft with the thrust plate (56), lockwashers, and bolts.

(4) Position the key (55) in the camshaft keyway. Install the gear (54) with the camshaft and crankshaft positioned so that the timing gear marks are in alinement as shown in figure 57. Secure the gear washer and lockwasher and the bolt securing the gear to the camshaft.

(5) Check the end play of the camshaft with a feeler gage inserted between the camshaft gear and the thrust plate. The clearance should be .003 inch to .0055 inch. Reduce the clearance by placing a thin shim between the thrust plate spacer and the cam shaft shoulder. Increase the clearance by dressing-off the spacers lightly.

(6) Check the backlash between the timing gears with a dial indicator. The tolerance should not be more than .002 inch.

e. VALVE MECHANISM (fig. 41).

(1) Replace the valve guides (18) by using a valve guide driver. Position the exhaust valve guide 1 inch and the intake valve guide 1-5/16 inch below the top face of the cylinder block as shown in figure 58.

(2) Assemble the valve springs (16) and rotocaps (17) in the engine with the closed coils of the springs placed against the cylinder block.

(3) Install the valves (15) in the same positions from which they were removed.

(4) Compress the springs on the valves which are in closed position. Insert the valve locks (14) in the valve stem groove. Turn the crankshaft until the open valves become closed and install the remaining valve locks.

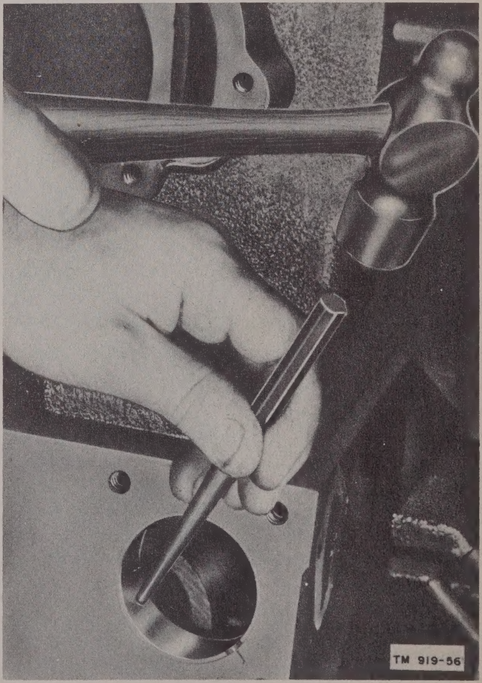


Figure 56. Staking camshaft bearing.

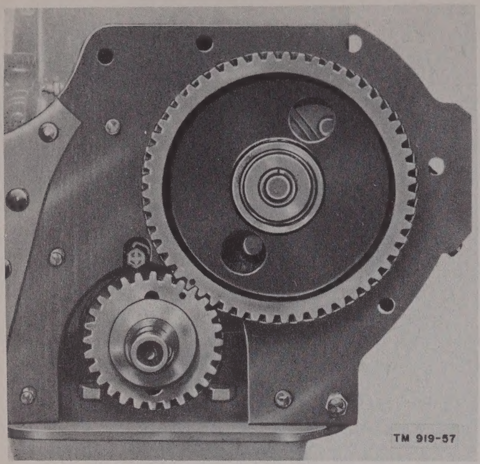


Figure 57. Timing gears, punch marks alined.

(5) Refer to paragraph 62*c* and adjust the valve tappets as instructed.

(6) Remove the cloth from the valve compartment floor openings. Then cement a new gasket (13) in position on the valve cover plate (12). Install the cover. Be sure the copper ring gaskets are under the attaching cover plate screws.

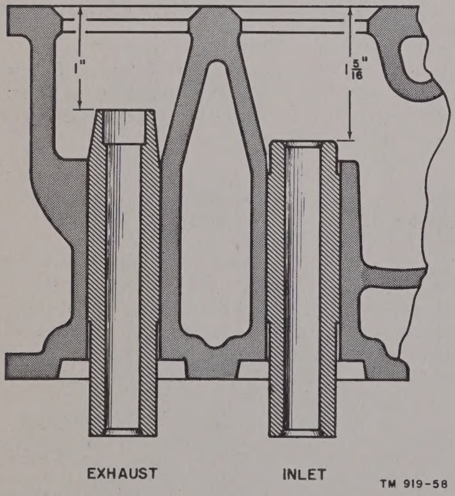


Figure 58. Position of valve guides.

f. Gear Cover (fig. 41).

(1) Slip the crankshaft gear spacer (62) and the oil slinger (61) onto the crankshaft.

(2) Tap the oil seal (51) into the gear cover (49) with a small block of wood.

(3) Coat the gear cover gasket (50) with gasket cement and position the gasket on the gear cover.

(4) Secure the cover and gasket to the block with the bolts, lockwashers, and nuts.

(5) Insert the key (60) in the crankshaft keyway and press the pulley (48) onto the shaft. Then secure the crank ratchet (47) to the shaft.

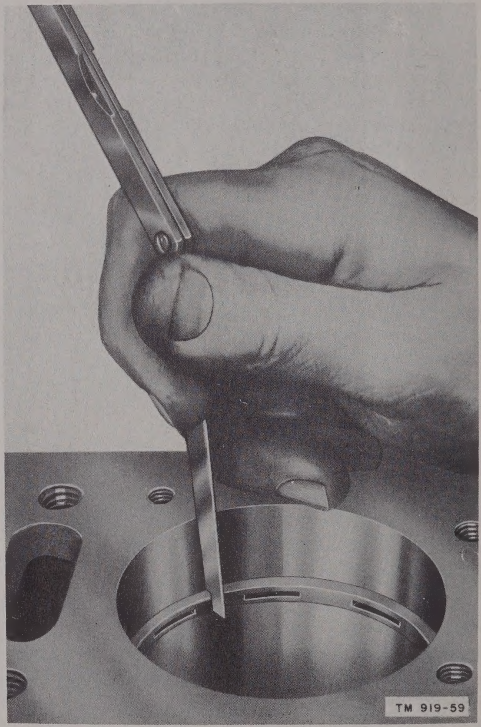


Figure 59. Measuring piston ring gap.

g. Connecting Rods and Pistons (fig. 41).

(1) Refer to paragraph 58*g*(16) and check the piston clearance as instructed.

(2) Check the piston ring gap as follows: Push the ring into the cylinder with a piston. Check the end gap with a feeler gage as shown in figure 59. The end gap should be .008 inch to .013 inch. Check each piston ring individually.

(3) Check the piston ring groove clearance. Groove clearance of the upper compression ring should be .002 inch to .004 inch; that of the lower compression ring should be .0015 inch to .0035 inch. Clearance of the oil regulating ring should be .001 inch to .0025 inch.

(4) Clamp the connecting rod in a vise; use vise jaw shields of soft metal or hardwood. Start the piston pin into the piston with the lockscrew groove facing down. Assemble the piston to the connecting rod with the slot in the piston on the opposite side from the oil spray hole in the bearing end of the rod. Install the piston pin lockscrew and lockwasher. Refer to paragraph 58*g*(13) and check the alinement of the connecting rod as instructed.

(5) Use a conventional ring tool and install the rings on the pistons as follows: Position the upper compression ring with the inside beveled edge toward the top as shown in figure 60. The face of the lower compression ring is tapered .001 inch and the letters T or T-O-P on the upper edge (fig. 60) indicate how the ring should be installed. Install the rings with the ring gaps staggered around the piston.

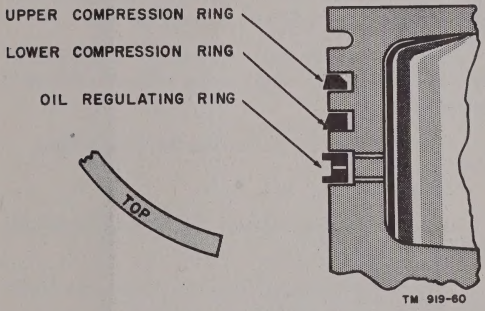


Figure 60. Piston ring installation.

(6) Apply oil (OE) to the piston. Install a ring compressor over the rings on the piston. Then force the connecting rod and piston (33) down through the cylinder bore by tapping the top of the piston with a hammer handle. Install the connecting rod bearings (31 and 32). Aline the oil spray holes in the upper bearing with the spray holes in the connecting rods. The spray holes should be facing away from the camshaft. (Because of the offset on the rods, the No. 1 rod cannot be interchanged with No. 2 and the No. 3 rod cannot be interchanged with No. 4.) The clearance between the bearings and the crankshaft journal should be checked with a .002-inch test shim. Place the shim between the bearing and the shaft journal; tighten the cap nuts to a tension of 35 to 40 pounds. A slight drag on the shaft, when turned by hand, indicates that the clearance is correct. Remove the shim and reinstall the cap. The standard side clearance of the bearing is .005 inch to .009 inch, which should be measured with a feeler gage as shown in figure 61.

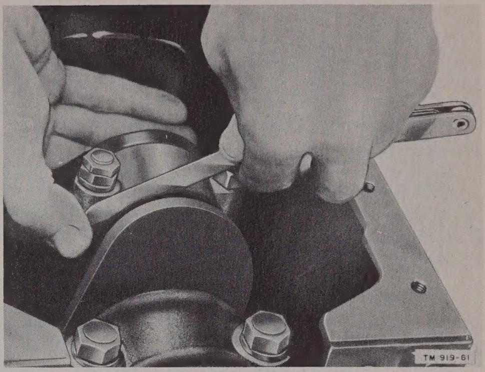


Figure 61. Checking connecting rod end play.

(7) The spring locknuts should be renewed. Install them with the flat face toward the connecting rod nut. Turn the locknuts fingertight. Then tighten them with a wrench 1/2 turn.

h. OIL PUMP.

(1) Assemble the outer rotor (8, fig. 44) and the inner rotor and shaft (7) in the oil pump body (13).

(2) Position the gasket (6) and the cover (5) on the pump body and secure them with the bolts (3) and lockwashers (4).

(3) Secure the gear (2) to the pump shaft with the retaining pin (1). Check the clearance between the gear and pump body with a feeler gage. This clearance should be from .003 inch to .010 inch.

(4) Insert the plunger (12) and the spring (11) in the pump body and secure them with the relief valve retainer (9) and the gasket (10).

(5) Position the gasket (29, fig. 41) on the pump body and secure the oil pump (28) to the engine with the mounting bolts. In order to correctly time the engine, the slot in the oil pump shaft must be vertical and offset toward the rear of the engine. After the oil pump has been installed, check this position through the distributor shaft opening in the block.

Note. To install the oil pump with the igniter assembly in the block when it is certain that the crankshaft has not been moved, proceed as follows: Correctly mesh the pump gear with the driving gear on the camshaft to allow engagement of the offset drive tongue on the distributor shaft with the pump shaft driving slot. This must be done without moving the distributor rotor. Assembly can be made in only one position as the slot and drive tongue are machined off-center.

i. OIL PAN (fig. 41).

(1) Position a new gasket (27) on the oil float support flange and secure the float support (26) to the engine with the bolts and lockwashers.

(2) Secure the oil float (25) to the float support with a cotter pin.

(3) Install the oil pan (23) temporarily and check to determine that the front main counterweight does not hit the front end of the oil pan. Should there be interference, bend the pan forward to obtain clearance.

(4) Position the oil pan gasket (24) on the oil pan. Secure the pan to the engine with the bolts and lockwashers. Tighten the bolts to a tension of 10 to 14 pounds.

j. CYLINDER HEAD (fig. 41).

(1) Position the cylinder head gasket (11) on the block without using sealer or other compound.

(2) Place the cylinder head (10) on the block and install the cylinder head nuts fingertight. Then tighten the nuts with a torque wrench to a tension of 60 to 65 pounds in accordance with the sequence shown in figure 62. Tighten the nuts gradually two or three times to reach the recommended torque value.

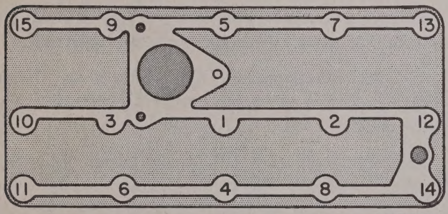


Figure 62. Cylinder head nut tightening sequence.

(3) Adjust the spark plugs; set the electrode gap at .030 inch. Install the spark plugs to prevent any foreign matter entering the combustion chambers during the remaining operations.

(4) Install the thermostat (9), thermostat adapter (8), and thermostat retainer (7) in the coolant outlet elbow (5).

(5) Position the outlet elbow gasket (6) and secure the coolant outlet elbow on the cylinder head.

k. WATER PUMP.

(1) Press the bearing (8, fig. 43) on the long end of the shaft (9) until the sealed side of the bearing is against the shaft shoulder. Position the sleeve (7) on the shaft. Press the bearing (6) on the shaft with the sealed side facing out until the bearing is tight against the sleeve.

(2) Support the assembly on the impeller end of the shaft and install the fan pulley (5). The pulley must be tight against the bearing with the end of the shaft flush with the front face of the pulley hub.

(3) Fully pack the area around the sleeve between the two bearings with grease (GL). The bearings are sealed and further lubrication during operation is not required.

(4) Install the assembly in the pump body (2) from the front end until the inside bearing butts against the shoulder in the pump body. To insure correct belt and fan alinement, the distance between the machined face (rear) of the pump body and the fan mounting face of the pulley *must* be 4-23/32 inches.

(5) Dip the seal (4) and the seal washer (3) in hydraulic brake fluid and then position them on the shaft.

(6) Place the impeller (1) on an arbor press and install the shaft into the impeller until the end of the shaft is flush with the hub of the impeller.

(7) Position the gasket (22, fig. 41) and secure the water pump (21) to the engine with the bolts and lockwashers.

(8) Install the by-pass line to the cylinder head.

l. MANIFOLDS (fig. 41).

(1) Position a new gasket (4) over the manifold studs on the block.

(2) Secure the exhaust manifold (3) to the block with the nuts and washers.

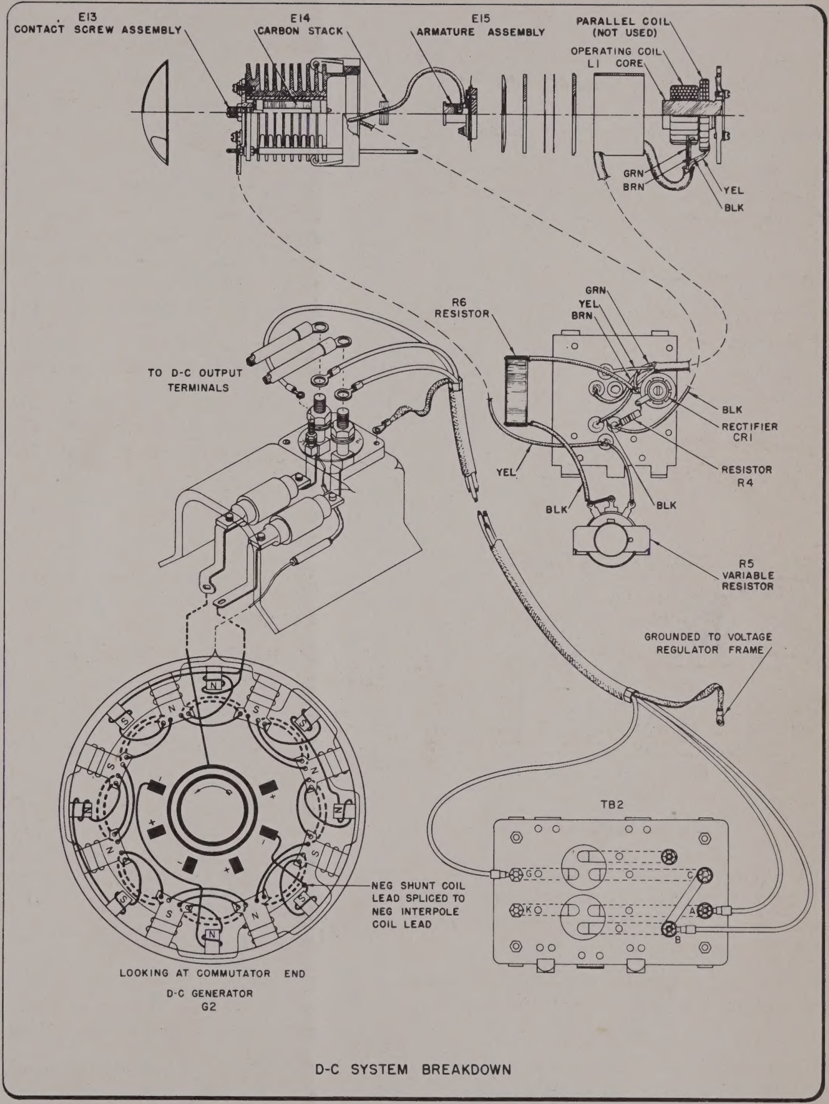
(3) Position a new gasket (2) on the exhaust manifold. Then place the intake manifold (1) in position and install the bolts and lockwashers which secure the manifolds together. Secure the intake manifold to the block with the nuts and washers. Then tighten all manifold nuts to a tension of 31 to 35 pounds.

m. INSTALLATION OF ENGINE.

(1) Secure a hoist to the engine lifting eyes and position the engine in the lower frame. Secure the engine and shock mounts with the mounting bolts.

(2) Secure the two ground straps on the front engine mounts to the engine.

(3) Reinstall the muffler, radiator, and other subassemblies and accessories in accordance with pertinent instructions in paragraph 61.


E13
CONTACT SCREW ASSEMBLY
E14
CARBON STACK
E15
ARMATURE ASSEMBLY
PARALLEL COIL
(NOT USED)
OPERATING COIL
L1 CORE
GRN
BRN
YEL
BLK
R6
RESISTOR
GRN
YEL
BRN
TO D-C OUTPUT
TERMINALS
BLK
RECTIFIER
CR1
RESISTOR
R4
YEL
BLK
BLK
R5
VARIABLE
RESISTOR
GROUNDED TO VOLTAGE
REGULATOR FRAME
TB2
G
C
K
A
B
NEG SHUNT COIL
LEAD SPLICED TO
NEG INTERPOLE
COIL LEAD
N
S
LOOKING AT COMMUTATOR END
D-C GENERATOR
G2
D-C SYSTEM BREAKDOWN

TM 919-63

Figure 63. Pictorial wiring diagram and d-c system breakdown.

i. Oil Pan (fig. 41).

(1) Position a new gasket (27) on the oil float support flange and secure the float support (26) to the engine with the bolts and lockwashers.

(2) Secure the oil float (25) to the float support with a cotter pin.

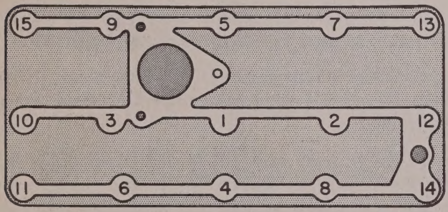
(3) Install the oil pan (23) temporarily and check to determine that the front main counterweight does not hit the front end of the oil pan. Should there be interference, bend the pan forward to obtain clearance.

(4) Position the oil pan gasket (24) on the oil pan. Secure the pan to the engine with the bolts and lockwashers. Tighten the bolts to a tension of 10 to 14 pounds.

j. Cylinder Head (fig. 41).

(1) Position the cylinder head gasket (11) on the block without using sealer or other compound.

(2) Place the cylinder head (10) on the block and install the cylinder head nuts fingertight. Then tighten the nuts with a torque wrench to a tension of 60 to 65 pounds in accordance with the sequence shown in figure 62. Tighten the nuts gradually two or three times to reach the recommended torque value.



TM 919-62

Figure 62. Cylinder head nut tightening sequence.

(3) Adjust the spark plugs; set the electrode gap at .030 inch. Install the spark plugs to prevent any foreign matter entering the combustion chambers during the remaining operations.

(4) Install the thermostat (9), thermostat adapter (8), and thermostat retainer (7) in the coolant outlet elbow (5).

(5) Position the outlet elbow gasket (6) and secure the coolant outlet elbow on the cylinder head.

k. Water Pump.

(1) Press the bearing (8, fig. 43) on the long end of the shaft (9) until the sealed side of the bearing is against the shaft shoulder. Position the sleeve (7) on the shaft. Press the bearing (6) on the shaft with the sealed side facing out until the bearing is tight against the sleeve.

(2) Support the assembly on the impeller end of the shaft and install the fan pulley (5). The pulley must be tight against the bearing with the end of the shaft flush with the front face of the pulley hub.

(3) Fully pack the area around the sleeve between the two bearings with grease (GL). The bearings are sealed and further lubrication during operation is not required.

(4) Install the assembly in the pump body (2) from the front end until the inside bearing butts against the shoulder in the pump body. To insure correct belt and fan alinement, the distance between the machined face (rear) of the pump body and the fan mounting face of the pulley *must* be 4-23/32 inches.

(5) Dip the seal (4) and the seal washer (3) in hydraulic brake fluid and then position them on the shaft.

(6) Place the impeller (1) on an arbor press and install the shaft into the impeller until the end of the shaft is flush with the hub of the impeller.

(7) Position the gasket (22, fig. 41) and secure the water pump (21) to the engine with the bolts and lockwashers.

(8) Install the by-pass line to the cylinder head.

l. Manifolds (fig. 41).

(1) Position a new gasket (4) over the manifold studs on the block.

(2) Secure the exhaust manifold (3) to the block with the nuts and washers.

(3) Position a new gasket (2) on the exhaust manifold. Then place the intake manifold (1) in position and install the bolts and lockwashers which secure the manifolds together. Secure the intake manifold to the block with the nuts and washers. Then tighten all manifold nuts to a tension of 31 to 35 pounds.

m. Installation of Engine.

(1) Secure a hoist to the engine lifting eyes and position the engine in the lower frame. Secure the engine and shock mounts with the mounting bolts.

(2) Secure the two ground straps on the front engine mounts to the engine.

(3) Reinstall the muffler, radiator, and other subassemblies and accessories in accordance with pertinent instructions in paragraph 61.

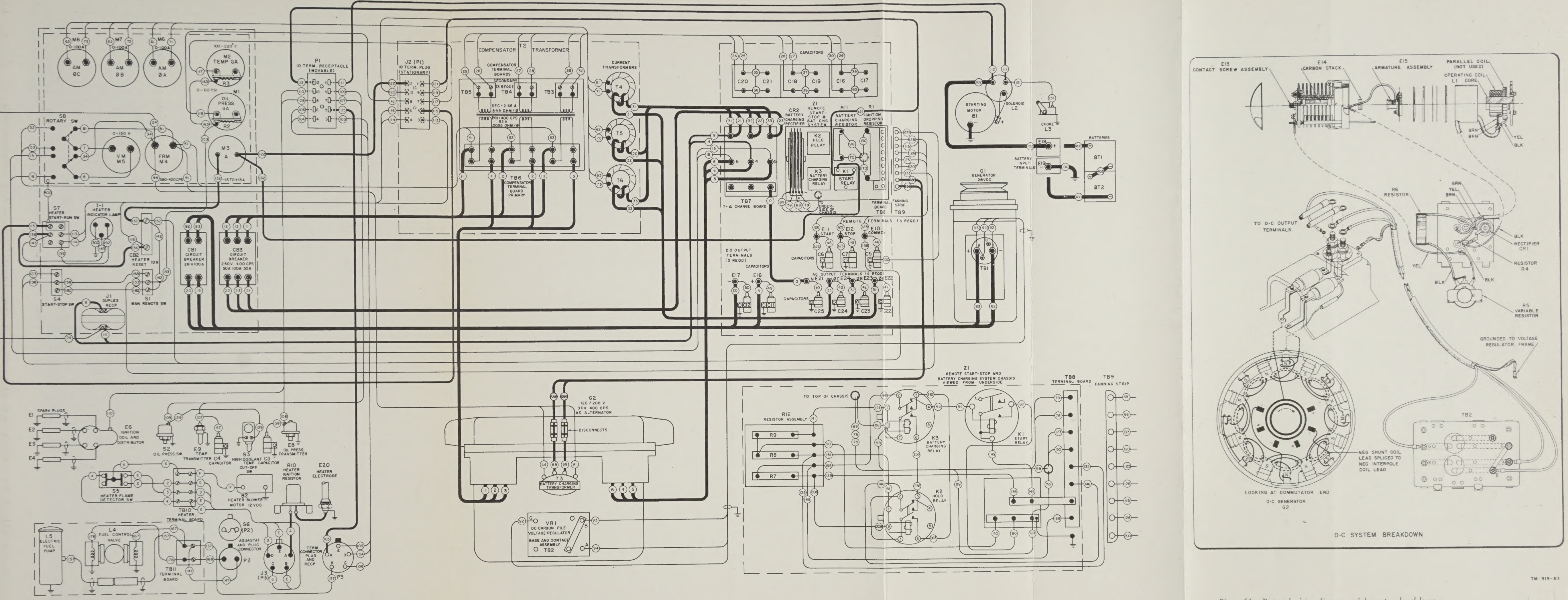

M8 AM ØC
M7 AM ØB
M6 AM ØA
M2 TEMP GA 100-220°F
R3
M1 OIL PRESS GA 0-60 PSI
R2
S8 ROTARY SW
VM M5 0-150 V
FRM M4 380-420CPS
M3 A -15TO+15A
S7 HEATER START-RUN SW
I-1 HEATER INDICATOR LAMP
CB2 HEATER RESET 10A
S4 START-STOP SW
J1 DUPLEX RECP
S1 MAN. REMOTE SW
CB1 CIRCUIT BREAKER 28 V 100A
CB3 CIRCUIT BREAKER 250V 400 CPS 50A 100A 50A
P1 10 TERM. RECEPTACLE (MOVABLE)
J2 (P1) 10 TERM. PLUG (STATIONARY)
T2 COMPENSATOR TRANSFORMER
COMPENSATOR TERMINAL BOARDS (3 REQD)
TB5 TB4 TB3
SECONDARY
SEC = 2.65 A .549 OHM/Ø
PRI = 400 CPS 52 A .0035 OHM/Ø
TB6 COMPENSATOR TERMINAL BOARD PRIMARY
CURRENT TRANSFORMERS
T4 T5 T6
TB7 Y-Δ CHANGE BOARD
CAPACITORS
C20 C21 C18 C19 C16 C17
CR2 BATTERY CHARGING RECTIFIER
Z1 REMOTE START-STOP & BAT. CHG SYSTEM
K2 HOLD RELAY
K3 BATTERY CHARGING RELAY
R11 BATTERY CHARGING RESISTOR
R1 IGNITION DROPPING RESISTOR
K1 START RELAY
TO UNDER-SIDE OF CHASSIS
TERMINAL BOARD TB8
FANNING STRIP TB9
REMOTE TERMINALS (3 REQD)
E11 START E12 STOP E10 COMMON
C6 C7 C5
DC OUTPUT TERMINALS (2 REQD)
E17 E16
AC OUTPUT TERMINALS (4 REQD)
E21 E24 E23 E22
C25 C24 C23 C22
STARTING MOTOR B1
SOLENOID L2
CHOKE L3
BATTERY INPUT TERMINALS
E18 E19
BATTERIES BT1 BT2
G1 GENERATOR 28VDC
TB1
G2 120/208 V 3 PH 400 CPS AC ALTERNATOR
DISCONNECTS
T3 BATTERY CHARGING TRANSFORMER
VR1 DC CARBON PILE VOLTAGE REGULATOR
BASE AND CONTACT ASSEMBLY TB2
SPARK PLUGS E1 E2 E3 E4
E6 IGNITION COIL AND DISTRIBUTOR
S2 OIL PRESS SW
E9 TEMP TRANSMITTER
C4 CAPACITOR
S3 HIGH COOLANT TEMP CUT-OFF SW
C3 CAPACITOR
E8 OIL PRESS TRANSMITTER
R10 HEATER IGNITION RESISTOR
E20 HEATER ELECTRODE
S5 HEATER FLAME DETECTOR SW
TB10 HEATER TERMINAL BOARD
B2 HEATER BLOWER MOTOR 12 VDC
L5 ELECTRIC FUEL PUMP
L4 FUEL CONTROL VALVE
TB11 TERMINAL BOARD
S6 (P2)
P2
AQUASTAT AND PLUG CONNECTOR
J3 (P3)
TERM CONNECTOR PLUG AND RECP
P3
Z1 REMOTE START-STOP AND BATTERY CHARGING SYSTEM CHASSIS VIEWED FROM UNDERSIDE
TO TOP OF CHASSIS
R12 RESISTOR ASSEMBLY
R9 R8 R7
K3 BATTERY CHARGING RELAY
K1 START RELAY
K2 HOLD RELAY
TB8 TERMINAL BOARD
TB9 FANNING STRIP
E13 CONTACT SCREW ASSEMBLY
E14 CARBON STACK
E15 ARMATURE ASSEMBLY
PARALLEL COIL (NOT USED)
OPERATING COIL L1 CORE
GRN BRN YEL BLK
R6 RESISTOR
TO D-C OUTPUT TERMINALS
RECTIFIER CR1
RESISTOR R4
R5 VARIABLE RESISTOR
GROUNDED TO VOLTAGE REGULATOR FRAME
TB2
NEG SHUNT COIL LEAD SPLICED TO NEG INTERPOLE COIL LEAD
LOOKING AT COMMUTATOR END
D-C GENERATOR G2
D-C SYSTEM BREAKDOWN
TM 919-63

Figure 63. Pictorial wiring diagram and d-c system breakdown.

60. Reassembly of Alternator

(fig. 36)

a. Press the bearing (17) into the bearing liner (18). Then press the bearing onto the rotor shaft.

b. Secure the rotor drive plate (23) to the rotor (24) with the bolts (21) and lockwashers (22). Install lockwires through the holes in the bolt heads.

c. Place a canvas belt around the rotor and attach the belt to a lifting hoist. Lift the rotor into position against the engine flywheel. Then secure the rotor assembly to the flywheel with bolts (19) and lockwashers (20). Install lockwires through the holes in the bolt heads.

d. Wipe the rotor clean. Make sure that there are no metal chips, shavings, washers, etc. held to it by magnetism.

e. Heat the outside of the stator housing (16). Slip the stator (15) into place. Be sure it is alined correctly. Then feed the stator cables through the openings in the housing.

Caution: Do not raise the temperature of the stator housing above 180° F.

f. Hook a chain hoist into the lifting eye on the stator housing and swing the housing and stator assembly carefully over the rotor. Push the housing until it just touches the bearing liner.

g. Attach the bearing cover plate (11) to the stator housing by installing the bolts (9) and lockwashers (10) in the outer row of the plate. Slip two long bolts through the bearing cover plate and attach them to the bearing liner to keep the holes in line.

h. Heat the housing at the bearing end to facilitate pressing the liner into the housing. Then push the housing and stator assembly completely into position.

Caution: Do not raise the temperature of the stator housing above 180° F.

i. Secure the stator housing to the flywheel housing with the bolts (1), flat washers (2 and 3), lockwashers (4), and nuts (5).

j. Remove the two long alining bolts from the bearing liner and install the bolts (9) and lockwashers (10) in the inner row of the cover plate.

k. Position the screen (8) to the stator housing and secure it with the bolts (6) and lockwashers (7).

61. Installation of Subassemblies and Accessories

a. FUEL PUMP.

(1) Position the fuel pump gasket on the fuel pump flange.

(2) Install the fuel pump on the engine and secure it with the two bolts and lockwashers.

(3) Connect the fuel lines from the carburetor and the filter to the fuel pump.

b. ENGINE SPEED GOVERNOR.

(1) Position the governor on the engine and secure it with the three bolts, lockwashers, and flat washers. Do not tighten the bolts.

(2) Install the governor drive belt.

(3) Adjust the drive belt for about 1-inch deflection and tighten the governor mounting bolts.

(4) Connect the oil line from the governor to the valve cover plate.

(5) Connect the carburetor-to-governor linkage to the governor control arm and the carburetor throttle.

c. CARBURETOR AND OVERSPEED SAFETY GOVERNOR.

(1) Position the lead gasket, the heat shield, another lead gasket, and the overspeed safety governor on the intake manifold in that order.

(2) Place the composition gasket and carburetor on the governor.

(3) Secure the carburetor and governor to the intake manifold with two nuts and lockwashers.

(4) Connect the fuel line from the fuel pump to the carburetor.

(5) Position the air horn on the carburetor and secure it with the clamp.

(6) Connect the carburetor-to-governor linkage to the engine speed governor control arm and the carburetor throttle.

(7) Connect the manual throttle cable to the carburetor throttle control.

(8) Connect the automatic choke rod to the carburetor.

d. FUEL FILTER.

(1) Secure the fuel filter to the mounting bracket with the two bolts, nuts, lockwashers, and flat washers.

(2) Connect the fuel line from the filter to the fuel pump and the fuel line from the fuel inlet connection to the fuel filter.

(3) Be sure the drain cock is closed.

e. OIL PRESSURE CUTOFF SWITCH AND OIL TRANSMITTER.

(1) Screw the switch into the bottom of the tee fitting and the transmitter into the top.

(2) Connect the electrical leads as shown in figure 63.

f. MUFFLER.

(1) Place the muffler assembly in position on the unit.

(2) Secure the muffler with the clamp located on the front engine support.

(3) Position a new gasket between the exhaust pipe adapter and the exhaust manifold. Then secure the muffler assembly to the manifold with one bolt and two nuts.

(4) Secure the automatic choke in position on the adapter and attach the choke rod to the carburetor.

g. OIL FILTER.

(1) Secure the oil filter to the bracket on the engine with the two bolts, nuts, lockwashers, and flat washers.

(2) Connect the oil lines from the timing gear cover, engine speed governor, and engine block to the oil filter.

h. HIGH COOLANT TEMPERATURE CUTOFF SWITCH.

(1) Screw the cutoff switch into the coolant outlet elbow with the dial facing the left of the unit.

(2) Connect the electrical lead as shown in figure 63.

i. IGNITER ASSEMBLY.

(1) Loosen the screws which hold the timing hole cover, located on the flywheel housing just under the starting motor. Slide the cover to one side.

(2) Remove the No. 1 spark plug. Rotate the crankshaft until the No. 1 piston is coming up on the compression stroke and until the 5° mark on the flywheel is in the center of the timing hole as shown in figure 64.

Note. The oil pump must be installed as instructed in paragraph 59*b* *before* installation of the igniter assembly.

(3) Install the igniter assembly in the cylinder block. Use the rotor on the distributor shaft to turn the shaft until the rotor points toward the No. 1 spark plug terminal tower position with the contact points just breaking.

(4) Move the rotor back and forth slightly until the drive tongue on the end of the shaft enters the slot in the oil pump shaft. Slide the igniter assembly down into place. Rotate the igniter body until the contact points are just breaking. Then secure the igniter assembly to the engine block with one bolt and two lockwashers.

(5) Install the spark plugs. Connect the ignition cables. Place them in the cap terminal towers in the firing order sequence of 1-3-4-2.

(6) Connect the air hoses from the air cleaner and ventilating control valve to the igniter assembly.

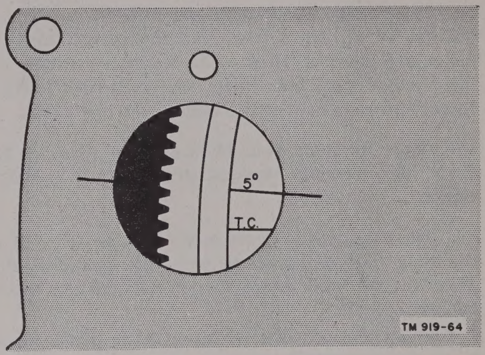


Figure 64. Flywheel timing marks.

j. STARTING MOTOR.

(1) Secure the starting motor to the flywheel housing with the two bolts and lockwashers.

(2) Connect the starting motor ground strap to the engine block.

(3) Connect the electrical leads to the solenoid switch and starting motor as shown in figure 63.

k. WINTERIZATION SYSTEM. To install the component parts of the winterization system, follow the applicable instructions below:

(1) *Heat exchanger pan.* Position the exchanger on the engine oil pan and secure it with the two bolts, nuts, and lockwashers. Connect the outlet tube to the heat exchanger pan.

(2) *Heater.*

(*a*) Secure the heater to the mounting bracket. Use the two bottom bolts and lockwashers only.

(*b*) Connect the coolant hoses to the engine and the heater and tighten the hose clamp.

(*c*) Install the heat exchanger tube to the combustion outlet on the top of the heater and to the heat exchanger. Tighten the clamps.

(*d*) Plug the socket containing the electrical leads into the heater.

(*e*) Position the heat shield and secure it with the top heater mounting bolts and lockwashers.

(3) *Fuel pump and fuel control valve.*

(*a*) Secure the fuel pump in the heater control box with the two bolts, nuts, and lockwashers. Mount the control valve with the four bolts and lockwashers.

(*b*) Connect the fuel line from the fuel filter to the fuel pump, the line from the pump to the control valve, and the line from the valve to the heater.

(*c*) Connect the electrical leads as shown in figure 63.

l. D-C GENERATOR.

(1) Position the generator on the engine and secure it with the two bolts, nuts, and lockwashers.

(2) Install the bolt securing the generator adjusting arm to the generator.

(3) Install the drive belt on the crankshaft pulley, water pump pulley, and generator pulley.

(4) Using the adjusting arm, adjust the belt tension to not more than 1/4-inch deflection (at 20 pounds pressure) midway between the fan and generator pulley.

(5) Connect the electrical leads as shown in figure 63.

(6) Secure the terminal insulator cap to the terminal board.

m. VOLTAGE REGULATOR.

(1) Position the regulator and base on the mounting bracket secured to the alternator.

(2) Grip the bottom of the rubber vibration mounts with an open-end wrench to prevent tearing the rubber and secure the attaching nuts.

(3) Connect the electrical leads to the regulator base as shown in figure 63.

n. RADIATOR.

(1) Secure the fan to the water pump pulley with the four bolts and lockwashers.

(2) Position the radiator on the lower frame and secure it to the bottom radiator support with the two nuts and lockwashers.

(3) Install the coolant hoses to the radiator, water pump, and engine. Tighten the radiator hose clamps.

(4) Secure the fan guard to the radiator.

o. UPPER FRAME.

(1) Position the upper frame on the lower frame and secure it at the four corners with the bolts, nuts, and lockwashers.

(2) Connect the two ground straps to the right and left sides of the upper frame.

(3) Connect the manual choke to the carburetor.

(4) Secure the radiator to the upper frame with the two bolts, nuts, and lockwashers.

(5) Connect all the electrical leads as shown in figure 63.

(6) Replace the breather line between the air cleaner and the oil-filler tube, and between the air cleaner inlet and outlet air-duct hose.

(7) Plug the ten-conductor socket into the receptacle mounted on the fire wall.

(8) Replace the clip, located on the fire wall, which secures the cable for the manual throttle and the tube for the primer.

(9) Reconnect the capacitor to the oil-pressure transmitter.

p. AIR CLEANER.

(1) Secure the air cleaner to the mounting brackets on the upper frame with the four bolts, nuts, and lockwashers.

(2) Connect the air line from the air cleaner to the igniter assembly and the breather line from the air cleaner to the oil-filler tube.

(3) Install the inlet and outlet air-duct hose from the air cleaner to the carburetor and air collector.

Section V. ADJUSTMENTS AND FINAL TESTING

62. Adjustments Prior to Final Testing

Previous to final testing of the unit after overhaul, certain adjustments must be made to insure efficient operation. Make these adjustments as instructed below:

a. IGNITION TIMING. If the ignition has not been timed, refer to paragraph 61*i* and proceed as instructed.

b. VALVE TIMING. With the valves timed as instructed in paragraph 59*d*(4), check the timing as follows: Carefully adjust the inlet valve tappet for No. 1 cylinder to .020 inch. Rotate the crankshaft clockwise until the piston in the No. 1 cylinder is ready for the intake stroke. The intake opens 9° before top dead center as shown in figure 65. Note the distance between

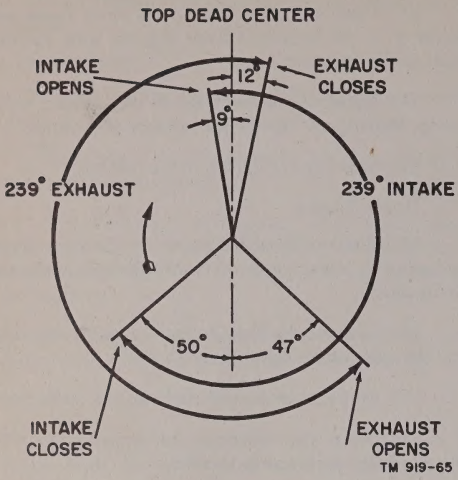


Figure 65. Valve timing.

the top center mark and the 5° mark and estimate the 9° position. With the crankshaft in this position, timing is correct if the tappet is just tight against the valve stem. Readjust the tappet to the running clearance of .016 inch.

c. VALVE TAPPETS. Check the valve tappet clearance with a feeler gage (fig. 66). Both the intake and exhaust tappet clearance must be .016 inch with the engine cold.

d. ENGINE SPEED GOVERNOR. Refer to paragraph 25*b* and adjust the engine speed governor as instructed.

e. ENGINE OVERSPEED SAFETY GOVERNOR. To adjust the overspeed safety governor, turn the adjusting screw clockwise until it stops. With the unit operating at 25-percent overload, turn the adjusting screw counterclockwise until the engine just starts to slow down. Then back off the adjusting screw clockwise two turns and seal the adjustment.

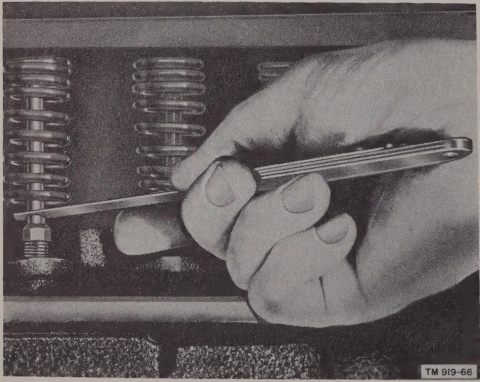


Figure 66. Checking valve tappet clearance.

f. CARBURETOR.

(1) *Idle adjustment.* When adjusting the idle jet (always with the engine hot) it should be set on the rich side of the highest vacuum. Attach a vacuum gage to the manifold and screw the idle adjusting screw in or out until the highest point of vacuum is reached. Then continue backing out the screw until the vacuum starts to recede from the highest point.

(2) *Altitude adjustment.* With the unit operating at rated full load, the altitude adjustment setting must be checked with an exhaust gas analyzer. Screw the adjusting screw in or out until the analyzer indicates a 13.0 to 1 air-fuel ratio.

(3) *Choke valve adjustment.* Place a .085 inch diameter pin through the hole in the engine side of the automatic choke shaft. Loosen the screw securing the choke lever to the shaft. Hold a 1/4 inch diameter dowel or rod between the carburetor choke valve and the front of the carburetor. Adjust the lever on the automatic choke until the choke valve in the carburetor is tight against the dowel. Tighten the screw securing choke lever. Remove dowel from the carburetor and pin from the hole in the choke shaft.

g. WINTERIZATION SYSTEM.

(1) *Fuel control valve.* Disconnect the fuel line at the heater and place a glass container graduated in cubic centimeters under the line. Start the heater and, with a stop watch, time the flow of fuel. Fill the glass container for approximately 2 or 3 minutes and measure the average fuel flow for 1 minute. Fuel flow should average 7 centimeters per minute with the heater operating on *low fire* and between 16 and 17 centimeters per minute with the heater operating on *high fire*. The adjustment screw, located on the dome in the center of the valve, controls the flow of fuel for both high and low fire. It is, therefore, necessary to find the best median for both high and low rating.

(2) *Flame switch.* To adjust the flame switch, back the flame-switch adjusting screw *out* until a click is heard. Then turn the adjusting screw *in* until a click is heard again. Turn the screw 3/4 of a turn beyond this point.

h. D-C VOLTAGE REGULATOR.

(1) Check the regulator to make sure that the flush position of the core and pole piece is marked on

the end plate and core with matching paint marks. Make sure the core and pole piece are flush.

(2) Turn the adjustment knob on the resistor to the middle of its range.

(3) Mount the regulator on the regulator base and connect the base as shown in the test wiring diagram (fig. 67).

(4) Start the unit and increase the speed to 1,500 rpm. Remove the end cover and turn the pile adjusting screw out (counterclockwise) until the voltage is 5 volts or less. Be sure the locknut is drawn up snug on the pile adjusting screw.

(5) Increase the generator speed to 4,550 rpm and with no load turn the adjusting screw in (clockwise). The voltage should begin to rise. Continue to turn the adjusting screw in until the voltage reaches a peak and begins to decrease. Turn the screw until the lowest point is reached.

(6) At the lowest point the unit begins to function as a regulator and the adjustment is approximately correct.

(7) Adjust the voltage to 28.0 volts by turning the core *in* to decrease voltage or *out* to increase voltage.

(8) Operate the regulator for approximately 30 minutes at no load with the generator running at a speed where the stack voltage equals one-half of the terminal voltage.

(9) Apply approximately 50 percent of generator output with the generator operating at 4,550 rpm. Note the change in voltage as the load is thrown on. The voltage should decrease not more than .1 volt. Turn the adjusting screw in or out (only a small fraction of a turn at a time), applying and removing load after each change, until the .1-volt (maximum) decrease with load is obtained.

(10) Again adjust the voltage to 28 volts by turning the core in or out. The generator should be operating without load for this adjustment.

Note. During the foregoing adjustment steps, the voltage resistor should not have been moved from the middle of its range. This is necessary to obtain the proper operating range of the regulator.

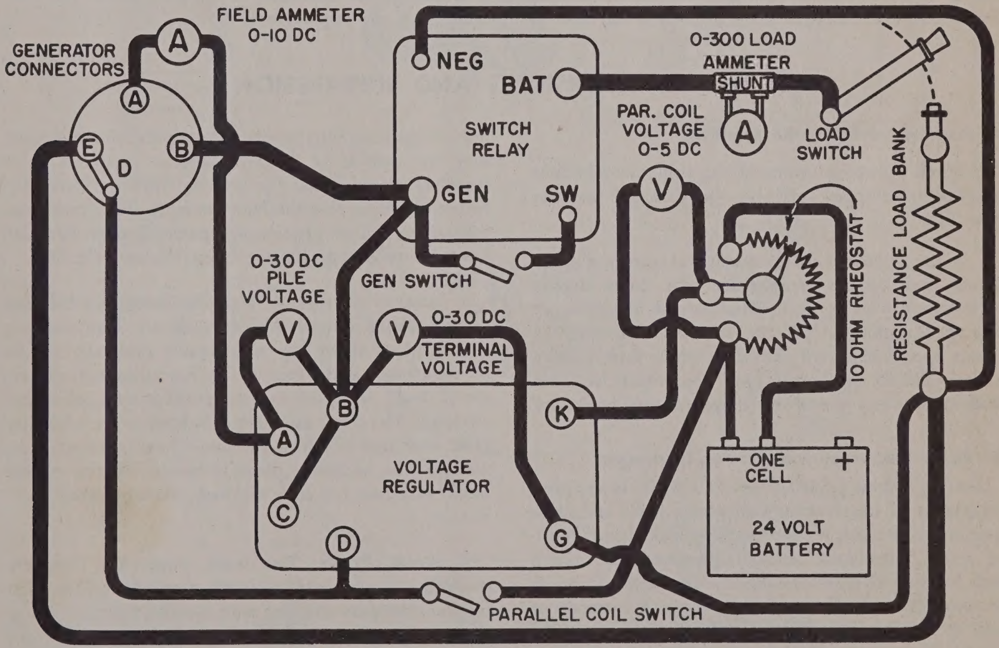

FIELD AMMETER
0-10 DC
GENERATOR CONNECTORS
A
A
E
B
D
NEG
BAT
SWITCH RELAY
GEN
SW
0-300 LOAD AMMETER
SHUNT
A
PAR. COIL VOLTAGE 0-5 DC
A
LOAD SWITCH
V
RESISTANCE LOAD BANK
10 OHM RHEOSTAT
0-30 DC PILE VOLTAGE
GEN SWITCH
V
V
0-30 DC
TERMINAL VOLTAGE
B
K
A
VOLTAGE REGULATOR
C
D
G
— ONE CELL +
24 VOLT BATTERY
PARALLEL COIL SWITCH
TM 919-67

Figure 67. Voltage regulator test wiring diagram.

(11) Recheck the adjustment as follows: Operate the generator at 4,550 rpm, no load with the resistor adjusted, to give terminal voltage of 28 volts. Apply 75-percent load to the generator in 25-percent steps. The maximum decrease in terminal voltage for 75-percent load is .2 volts.

(12) Check the stability of regulation as follows: Operate the generator at 4,550 rpm under no load. Open the shunt field circuit several times. The regulator must not vibrate or flutter more than 1 second after the switch is closed.

Note. A pair of headphones may be connected from field positive to armature positive for the purpose of checking vibration or flutter. A harsh crackling or pronounced hum heard in the headset indicates unstable operation. The vibration may also be felt by holding a finger on the end of the core if headphones are not available.

(13) Check the range of the regulator by operating the generator at no load (4,550 rpm). Rotate the resistor from one end of its range to the other. The terminal voltage should vary from 26 to 30 volts. The core may be turned in or out slightly to obtain the exact range.

(14) Check the minimum resistance of the regulator as follows: Operate the generator at 4,550 rpm with a terminal voltage of 28 volts. Apply full load to the generator. Decrease the generator speed until the regulated voltage is 26.5 volts, plus or minus .1 volt. Read the stack voltage and the shunt field current. Calculate the ohms resistance. Resistance should be .7 ohm or less. After checking the minimum resistance readjust the resistor to obtain 28 volts at the regulator while at operating temperature.

63. Testing and Inspection After Overhaul

a. Before starting the unit, refer to paragraph 21 and complete the preliminary procedure as instructed.

b. Start the unit as instructed (par. 22).

c. Certain precautions must be taken after the unit is in operation. Refer to paragraph 23 and follow the applicable instructions.

d. Apply load to the unit as instructed (par. 24). Apply only a 25-percent load during the first hour of operation. For each 1-hour period thereafter, increase the load in 25-percent steps until the unit is operating under full load. Check the performance at each load change with the characteristics given in paragraph 6.

e. During the operation of the unit, follow the procedure outlined in paragraph 25.

Section VI. REFINISHING AND SUPPRESSION

64. Painting and Weatherproofing

a. When painted portions of the equipment become scratched or chipped, refinish the damaged surfaces (par. 39).

b. If the windings in the stator, compensator transformer, and current transformer have been slightly scuffed, apply a coat of fungiproof varnish in accordance with specification JAN-T-152 and with TB SIG 13. Always apply fungiproof varnish to newly soldered connections and to any bare copper wire which has been installed. No other part of the equipment need be treated.

65. Radio-frequency Suppression Equipment

Gasoline Engine Generator Set PU-107/U is equipped to suppress r-f interference with nearby radio and radar equipment. The unit is suppressed with shielding, bonding straps, capacitors, resistor-suppressors, and bonds made by external-internal-toothed lockwashers. Examine the suppression equipment periodically in accordance with the instructions in paragraph 46. Whenever the unit has been overhauled, make sure that all suppression components have been installed correctly. The suppression equipment is designed to suppress r-f interference only when the unit is in satisfactory condition. If the unit is operating abnormally, the suppression equipment may not control the radio frequencies produced. It is therefore essential that the unit be checked thoroughly before assuming that the fault lies with the suppression equipment. All suppression equipment is described and located in subparagraphs *a* through *n* below (fig. 68).

a. IGNITER ASSEMBLY. The distributor and coil are housed within a metal shielded inclosure. Four resistors (5,000 ohms each) are incorporated integrally within the distributor at the four castles. A feedthrough capacitor (2.0 uf) is installed in the primary terminal of the assembly. The entire assembly is bonded to the adjusting plate with one 1/4-inch external-internal-toothed lockwasher. The adjusting plate is bonded to the engine block with one 1/4-inch external-internal-toothed lockwasher.

b. SPARK PLUGS. The spark plugs are integrally shielded and suppressed (10,000 ohms each). The high tension cables are shielded with metallic hose.

c. A-C OUTPUT TERMINALS. Four CA-472 capacitors (.01 uf each) are secured to the a-c output terminals and are bonded to the frame utilizing two 1/4-inch external-internal-toothed lockwashers each.

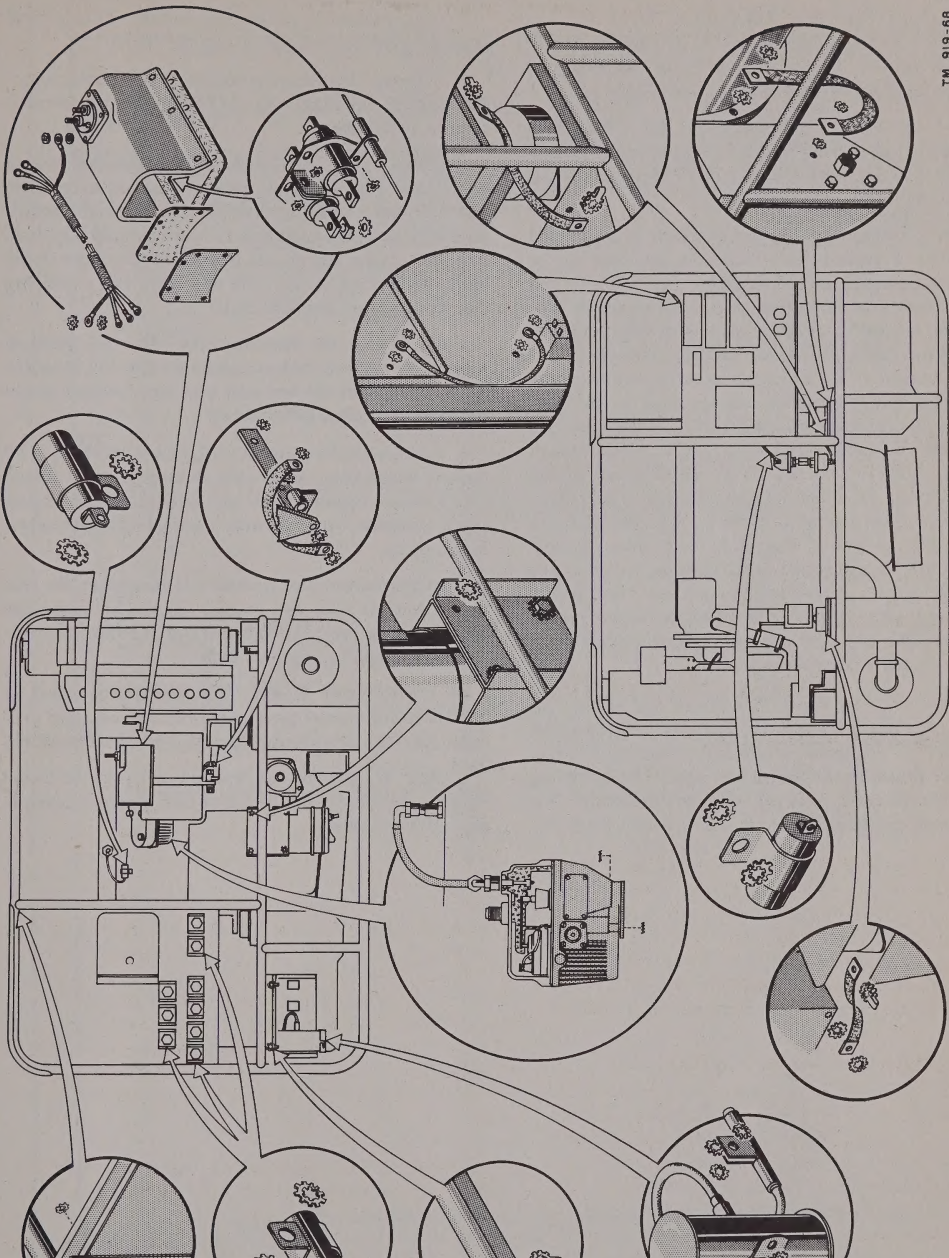


Figure 68. R-f suppression details.

d. REMOTE CONTROL TERMINALS. Three CA-442 capacitors (.1 uf each) are secured to the remote control terminals and are bonded to the frame utilizing two 1/4-inch external-internal-toothed lockwashers each.

e. D-C OUTPUT TERMINALS. Two CA-442 capacitors (.1 uf each) are secured to the d-c output terminals and are bonded to the frame utilizing two 1/4-inch external-internal-toothed lockwashers each.

f. D-C GENERATOR. The d-c generator is suppressed as follows: A ground strap bonds the generator to the generator mounting bracket utilizing two 3/8-inch and two 1/2-inch external-internal-toothed lockwashers. The mounting bracket is bonded to the engine block utilizing one 3/8-inch external-internal-toothed lockwasher. Two CA-491 capacitors (.1 uf each), in series with the plus and minus output terminals, are mounted in the generator capacitor cover utilizing two 1/4-inch and two No. 10 external-toothed lockwashers each. A feedthrough capacitor (.005 uf), in series with the field coil, is also installed in the cover. Special gaskets, made of cohralistic coated fabric, are used with the cover and cover plate to insure adequate ground. The three leads from the generator to the voltage regulator are shielded with metallic loom. The shield is grounded by means of a No. 10 flat washer and a No. 10 internal-toothed lockwasher on the generator end and two external-internal-toothed lockwashers on the voltage regulator end.

g. HEATER FUEL PUMP. The heater fuel pump contains a shielded lead and incorporates a feedthrough capacitor (.25 uf) sealed in the lead connector. The fuel pump is bonded to the heater fuel control box utilizing two 1/4-inch external-internal-toothed lockwashers. The lead mounting clip is bonded to the box with three No. 10 external-internal-toothed lockwashers. Two ground clips are used to bond the box to the frame.

h. HEATER. The heater is bonded to the heater mounting bracket utilizing four 3/8-inch external-internal-toothed lockwashers.

i. ENGINE. The front of the engine block is bonded to the front engine mounts with two ground straps (left and right side) utilizing two 3/8-inch external-internal-toothed lockwashers and one 1/4-inch ground clip each. The rear engine mounts are bonded to the upper frame with two ground straps (left and right side) utilizing two 1/4-inch ground clips each.

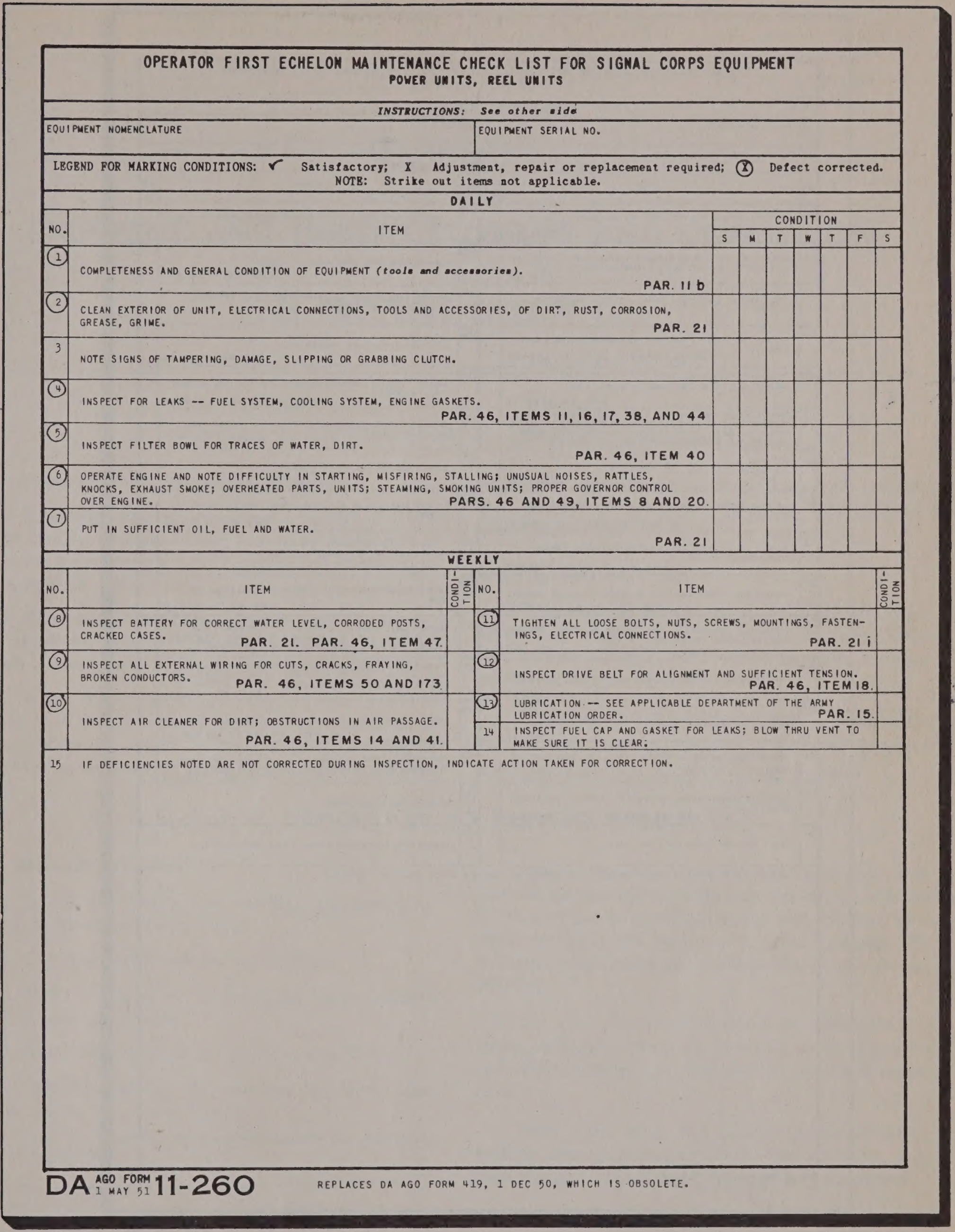
j. OIL PRESSURE TRANSMITTER. The oil pressure transmitter is suppressed by means of a CA-442 capacitor (.1 uf) bonded to the fire wall with two 1/4-inch external-internal-toothed lockwashers.

k. COOLANT TEMPERATURE TRANSMITTER. The coolant temperature transmitter is suppressed by means of a CA-442 capacitor (.1 uf) bonded to the engine block utilizing two 1/4-inch external-internal-toothed lockwashers.

l. ALTERNATOR. The alternator is bonded to the rear engine mounts with two ground straps (left and right side) utilizing two 5/16-inch and two 3/8-inch external-internal-toothed lockwashers each.

m. INSTRUMENT PANEL. The instrument panel is bonded to the control panel with one ground strap utilizing four No. 10 external-internal-toothed lockwashers.

n. FIRE WALL. The fire wall is bonded to the frame with twelve No. 10 and four 1/4-inch external-internal-toothed lockwashers.



OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
POWER UNITS, REEL UNITS

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; Ⓧ Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION						
		S	M	T	W	T	F	S
①	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(tools and accessories)*. PAR. 11 b							
②	CLEAN EXTERIOR OF UNIT, ELECTRICAL CONNECTIONS, TOOLS AND ACCESSORIES, OF DIRT, RUST, CORROSION, GREASE, GRIME. PAR. 21							
3	NOTE SIGNS OF TAMPERING, DAMAGE, SLIPPING OR GRABBING CLUTCH.							
④	INSPECT FOR LEAKS -- FUEL SYSTEM, COOLING SYSTEM, ENGINE GASKETS. PAR. 46, ITEMS 11, 16, 17, 38, AND 44							
⑤	INSPECT FILTER BOWL FOR TRACES OF WATER, DIRT. PAR. 46, ITEM 40							
⑥	OPERATE ENGINE AND NOTE DIFFICULTY IN STARTING, MISFIRING, STALLING; UNUSUAL NOISES, RATTLES, KNOCKS, EXHAUST SMOKE; OVERHEATED PARTS, UNITS; STEAMING, SMOKING UNITS; PROPER GOVERNOR CONTROL OVER ENGINE. PARS. 46 AND 49, ITEMS 8 AND 20.							
⑦	PUT IN SUFFICIENT OIL, FUEL AND WATER. PAR. 21							

WEEKLY

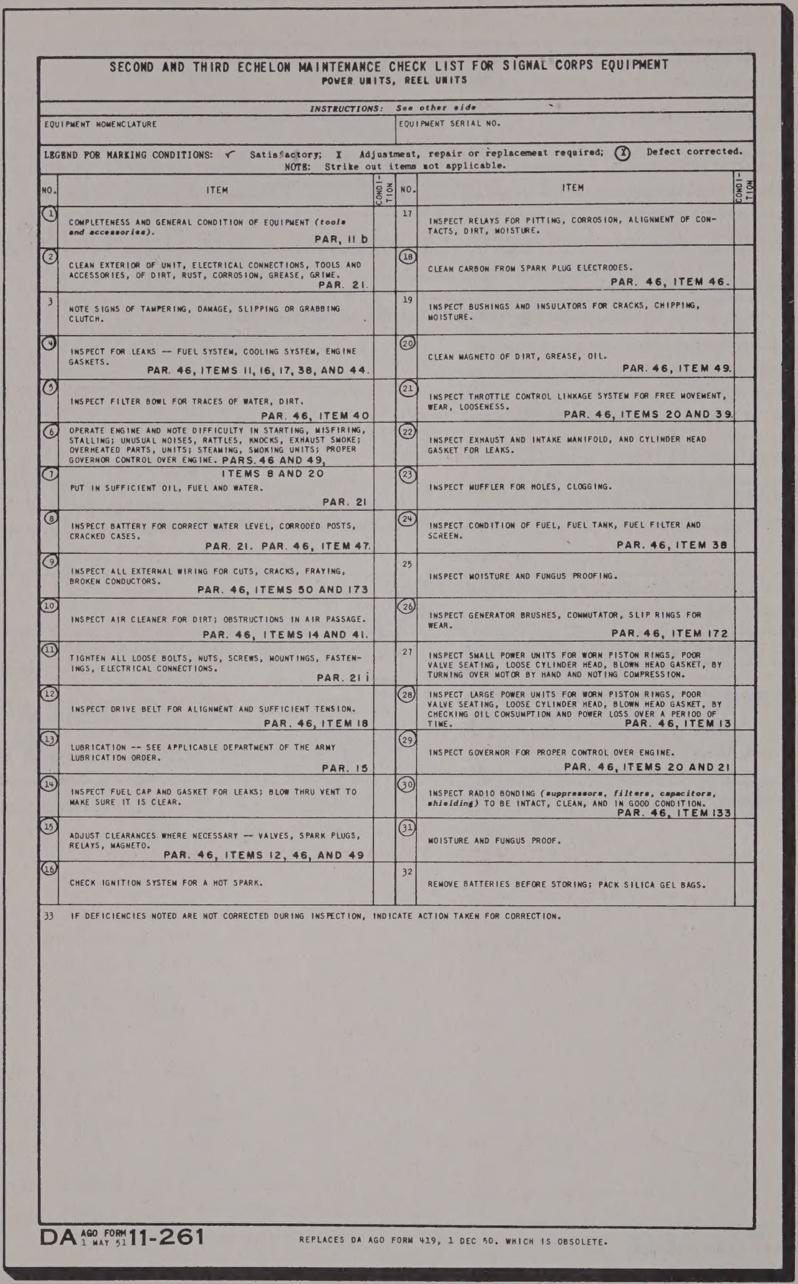
NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
⑧	INSPECT BATTERY FOR CORRECT WATER LEVEL, CORRODED POSTS, CRACKED CASES. PAR. 21. PAR. 46, ITEM 47.		⑪	TIGHTEN ALL LOOSE BOLTS, NUTS, SCREWS, MOUNTINGS, FASTENINGS, ELECTRICAL CONNECTIONS. PAR. 21 i	
⑨	INSPECT ALL EXTERNAL WIRING FOR CUTS, CRACKS, FRAYING, BROKEN CONDUCTORS. PAR. 46, ITEMS 50 AND 173.		⑫	INSPECT DRIVE BELT FOR ALIGNMENT AND SUFFICIENT TENSION. PAR. 46, ITEM 18.	
⑩	INSPECT AIR CLEANER FOR DIRT; OBSTRUCTIONS IN AIR PASSAGE. PAR. 46, ITEMS 14 AND 41.		⑬	LUBRICATION -- SEE APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER. PAR. 15.	
			14	INSPECT FUEL CAP AND GASKET FOR LEAKS; BLOW THRU VENT TO MAKE SURE IT IS CLEAR.	

15 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA AGO FORM 1 MAY 51 **11-260** REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM 919-69

Figure 69. DA AGO Form 11-260.



SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
POWER UNITS, REEL UNITS

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE

EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; Ⓧ Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
①	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (*tools and accessories*). PAR, 11 b		17	INSPECT RELAYS FOR PITTING, CORROSION, ALIGNMENT OF CONTACTS, DIRT, MOISTURE.	
②	CLEAN EXTERIOR OF UNIT, ELECTRICAL CONNECTIONS, TOOLS AND ACCESSORIES, OF DIRT, RUST, CORROSION, GREASE, GRIME. PAR. 21.		⑱	CLEAN CARBON FROM SPARK PLUG ELECTRODES. PAR. 46, ITEM 46.	
3	NOTE SIGNS OF TAMPERING, DAMAGE, SLIPPING OR GRABBING CLUTCH.		19	INSPECT BUSHINGS AND INSULATORS FOR CRACKS, CHIPPING, MOISTURE.	
④	INSPECT FOR LEAKS -- FUEL SYSTEM, COOLING SYSTEM, ENGINE GASKETS. PAR. 46, ITEMS 11, 16, 17, 38, AND 44.		⑳	CLEAN MAGNETO OF DIRT, GREASE, OIL. PAR. 46, ITEM 49.	
⑤	INSPECT FILTER BOWL FOR TRACES OF WATER, DIRT. PAR. 46, ITEM 40		㉑	INSPECT THROTTLE CONTROL LINKAGE SYSTEM FOR FREE MOVEMENT, WEAR, LOOSENESS. PAR. 46, ITEMS 20 AND 39.	
⑥	OPERATE ENGINE AND NOTE DIFFICULTY IN STARTING, MISFIRING, STALLING; UNUSUAL NOISES, RATTLES, KNOCKS, EXHAUST SMOKE; OVERHEATED PARTS, UNITS; STEAMING, SMOKING UNITS; PROPER GOVERNOR CONTROL OVER ENGINE. PARS. 46 AND 49, ITEMS 8 AND 20		㉒	INSPECT EXHAUST AND INTAKE MANIFOLD, AND CYLINDER HEAD GASKET FOR LEAKS.	
⑦	PUT IN SUFFICIENT OIL, FUEL AND WATER. PAR. 21		㉓	INSPECT MUFFLER FOR HOLES, CLOGGING.	
⑧	INSPECT BATTERY FOR CORRECT WATER LEVEL, CORRODED POSTS, CRACKED CASES. PAR. 21. PAR. 46, ITEM 47.		㉔	INSPECT CONDITION OF FUEL, FUEL TANK, FUEL FILTER AND SCREEN. PAR. 46, ITEM 38	
⑨	INSPECT ALL EXTERNAL WIRING FOR CUTS, CRACKS, FRAYING, BROKEN CONDUCTORS. PAR. 46, ITEMS 50 AND 173		25	INSPECT MOISTURE AND FUNGUS PROOFING.	
⑩	INSPECT AIR CLEANER FOR DIRT; OBSTRUCTIONS IN AIR PASSAGE. PAR. 46, ITEMS 14 AND 41.		㉖	INSPECT GENERATOR BRUSHES, COMMUTATOR, SLIP RINGS FOR WEAR. PAR. 46, ITEM 172	
⑪	TIGHTEN ALL LOOSE BOLTS, NUTS, SCREWS, MOUNTINGS, FASTENINGS, ELECTRICAL CONNECTIONS. PAR. 21 i		27	INSPECT SMALL POWER UNITS FOR WORN PISTON RINGS, POOR VALVE SEATING, LOOSE CYLINDER HEAD, BLOWN HEAD GASKET, BY TURNING OVER MOTOR BY HAND AND NOTING COMPRESSION.	
⑫	INSPECT DRIVE BELT FOR ALIGNMENT AND SUFFICIENT TENSION. PAR. 46, ITEM 18		㉘	INSPECT LARGE POWER UNITS FOR WORN PISTON RINGS, POOR VALVE SEATING, LOOSE CYLINDER HEAD, BLOWN HEAD GASKET, BY CHECKING OIL CONSUMPTION AND POWER LOSS OVER A PERIOD OF TIME. PAR. 46, ITEM 13	
⑬	LUBRICATION -- SEE APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER. PAR. 15		㉙	INSPECT GOVERNOR FOR PROPER CONTROL OVER ENGINE. PAR. 46, ITEMS 20 AND 21	
⑭	INSPECT FUEL CAP AND GASKET FOR LEAKS; BLOW THRU VENT TO MAKE SURE IT IS CLEAR.		㉚	INSPECT RADIO BONDING (*suppressors, filters, capacitors, shielding*) TO BE INTACT, CLEAN, AND IN GOOD CONDITION. PAR. 46, ITEM 133	
⑮	ADJUST CLEARANCES WHERE NECESSARY -- VALVES, SPARK PLUGS, RELAYS, MAGNETO. PAR. 46, ITEMS 12, 46, AND 49		㉛	MOISTURE AND FUNGUS PROOF.	
⑯	CHECK IGNITION SYSTEM FOR A HOT SPARK.		32	REMOVE BATTERIES BEFORE STORING; PACK SILICA GEL BAGS.	

33 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA AGO FORM 1 MAY 51 11-261 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

Figure 70. DA AGO Form 11-261.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

66. Preparation for Storage or Shipment

a. If Gasoline Engine Generator Set PU-107/U is not to be used for 30 days or more, or is to be transported to a remote point, rustproof the equipment as instructed in paragraph 38.

b. After the unit has been processed (par. 38) inspect the finish for possible damage. If any damage to the finish is noted, refinish as instructed in paragraph 39.

c. When the operations in subparagraphs *a* and *b* above have been completed, place the equipment in its canvas cover and fasten the cover securely. See that all tools and spare parts are present and in good condition; replace any that may be missing. Wrap each tool and spare part in a moistureproof wrapping and mark it for identification.

67. Shipment

a. If the equipment is to be moved a short distance by truck or trailer, no crating will be required. However, protect the equipment with a tarpaulin or other suitable covering.

b. If the equipment is to be shipped a considerable distance, pack it in suitable crates or boxes in accordance with applicable joint Army-Navy specifications.

Section II. DEMOLITION TO PREVENT ENEMY USE

68. Methods of Demolition

a. SMASH. Use sledges, axes, handaxes, pickaxes, hammers, crowbars, and heavy tools.

b. CUT. Use axes, handaxes, and machetes.

c. BURN. Use gasoline, kerosene, oil, flame throwers, and incendiary grenades.

d. EXPLODE. Use firearms, grenades, and TNT.

e. DISPOSE. Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

Note. Use anything immediately available for destruction of this equipment.

69. Destruction of Components

When ordered by your commander, destroy all equipment to prevent its being used or salvaged by the enemy.

a. Smash (par. 68*a*) cylinder block, cylinder head, spark plugs, carburetor, muffler, air cleaner, oil and fuel filters, fuel pump, manifold, heater unit, radiator, governor, control panel instruments, priming pump, distributor, change board and terminal boards, and storage batteries.

b. Cut (par. 68*b*) remote fuel hose, remote control cables, engine and control panel wiring, connecting wires and cables, exhaust hose, fuel and oil lines, and canvas cover.

c. Burn (par. 68*c*) fuel, lubricants, canvas cover, packing cases, generator windings, wire and cable, technical manuals and all other literature and documents.

d. Dispose (par. 68*e*) of all remaining parts of the equipment.

DESTROY EVERYTHING

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310-20-3, SR 310-20-4, and SR 310-20-5. Check Department of the Army Supply Catalog SIG 1 for Signal Corps Supply Catalog pamphlets.

1. Army Regulations

AR 380-5	Military Security (Safeguarding Military Information).
AR 750-5	Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation).

2. Supply Bulletins

SB 11-47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11-76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.
SB 11-100	Serviceability Standards for Signal Equipment in the Hands of Troops.

3. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 23	Rustproofing of Engines.
TB SIG 69	Lubrication of Ground Signal Equipment.

4. Camouflage, Decontamination, and Demolition

FM 5-20	Camouflage, Basic Principles.
FM 5-25	Explosives and Demolition.
TM 3-220	Decontamination.

5. Other Publications

SR 310-20-3	Index of Training Publications.
SR 310-20-4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, and Tables of Equipment.
SR 310-20-5	Index of Administrative Publications.
SR 700-45-5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD-247).
SR 745-45-5 NAV DEPT SERIAL 85P00 AFR 71-4	Report of Damaged or Improper Shipment (Report Control Symbols CSGLD-66 (Army), SandA-70-6 (Navy), and AF-MC-U2 (Air Force)).
TB ORD 313	Spark Plugs.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TM 9-2700	Principles of Automotive Vehicles.
TM 9-2857	Storage Batteries, Lead-Acid Type.
TM 9-2858	Cooling Systems; Vehicles and Powered Ground Equipment.
TM 11-453	Shop Work.
TM 11-483	Suppression of Radio Noises.
TM 11-661	Electrical Fundamentals (Direct Current).
TM 11-681	Electrical Fundamentals (Alternating Current).
TM 37-2810	Motor Vehicle Inspection and Preventive Maintenance Services.
TM 55-405	Preventive Maintenance of Electric Motors and Generators.

APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note. The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a specific T/O&E, T/A, SIG 7-8-10, SIG 10, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manuel is SIG 7&8-PU-107/U. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index. Stock numbers designated with the superior letter *a* (e.g. 3RW7801[a]) are Signal Corps stock numbers; all others are Ordnance.

1. Generator Set, Gasoline Engine PU-107/U (Sig C Stock No. 3H3370-107)

Generator Set, Gasoline Engine PU-107/U consists of the following major components:

Ref symbol	Name of part and description	Function of part	Stock No.
	GASOLINE ENGINE. (See paragraph 2, this appendix, for engine and major engine component parts.)	Provides driving power for generators.	G716-8327459
	GENERATOR, ALTERNATING CURRENT. (See paragraph 3, this appendix, for a-c generator parts.)	Generates 400 cycle ac.	3H2441-4[a]
	GENERATOR, DIRECT CURRENT. (See paragraph 4, this appendix, for d-c generator parts.)	Generates 28.5 volts dc.	3H2441-5[a]
	CONTROL PANEL AND ACCESSORIES. (See paragraph 5, this appendix, for parts.)		
	TOOLS, FRAME, AND MISCELLANEOUS PARTS. (See paragraph 6, this appendix, for parts.)		
	WINTERIZATION AND HEATER PARTS. (See paragraph 6, this appendix, for parts.)		

2. Gasoline Engine Parts

a. AIR CLEANER GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
A27	ADAPTER ASSEMBLY, air cleaner: u/w Houdaille-Hershey air cleaner; c/o adapter-hose, air cleaner, Okeefe & Merritt part/dwg No. 121682; one damper-air cleaner, Okeefe & Merritt part/dwg No. 121684; one strap assy—adapter hose, (drilled) Okeefe & Merritt part/dwg No. 121677; one strap assy—adapter hose, (tapped) Okeefe & Merritt part/dwg No. 121679; sheet steel; irregular shaped; body, 144° of 7-3/8" dia circle x 2-7/8" h w/1-7/16" flange at top, and 19/32" flange at bottom formed toward ctr of arc; two parallel mating ears on strap assy ea end for clamping around air cleaner body; w/sliding damper plate for selection of either preheated air or outside air; Okeefe & Merritt part/dwg No. 121681.	Intake air selector.	
H403, H404, H405, H406, H407	CLAMP: SS band, alloy steel adjusting screw; o/a physical dimen 2-¾" max dia, 2-5/16" dia nom, 9/16" wd band; clamps 2-1/8" rubber air duct hose and 2-5/16" carburetor air horn; slot-type take-up drive; Breeze part No. QS100-M32S.	Carburetor air horn and air cleaner hose clamps.	

a. AIR CLEANER GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
H408	CLEANER ELEMENT, air: steel wool w/copper finish cleaning agent; re-usable; cylindrical shaped, 6-1/4″ lg excluding mtg screw, 5-3/8″ dia, 15/16″ lg mtg screw protruding one end; p/o Houdaille-Hershey air cleaner; Oakes Products Division of Houdaille-Hershey part No. 613387.	Air cleaner element and wing bolt assembly.	G503-169093
H397, H398	FITTING, pipe: 90° street elbow; brass; 1/8″ male IPS x 1/8″ female; Imperbrass part No. 116-B.	Breather tube and ignitor line elbows.	H006-0265100
H400	GASKET: soft cork comp; one hole; round shaped, 5-5/8″ OD x 5-1/16″ ID x 3/16″ thk; p/o Houdaille-Hershey air cleaner; Oakes Products Division of Houdaille-Hershey part No. 613313.	Air cleaner body gasket.	G503-7010486
H399	GASKET: soft cork comp; one hole; round shaped 6-5/16″ ID x 6-13/16″ OD x 1/4″ thk; grooved fit one side; p/o Houdaille-Hershey air cleaner; Oakes Products Division of Houdaille-Hershey part No. 613314.	Oil reservoir gasket.	G503-7010485
H395, H402	HOSE, air duct: 2-1/8″ OD x 2″ ID x 18-1/2″ lg; w/soft ends for mtg; US Rubber style P222-8-1816-S.	Connects air cleaner with carburetor air horn and preheater chamber with air cleaner.	G780-7418452
H401	LINE, air: straight flexible tube 1/4″ ID x 7/16″ OD by 13″ lg; 7/16″-24 thd male inverted flare swivel fitting one end, 1/8″ IPS male thd other end; Okeefe & Merritt part/dwg No. 122400.	Connects air cleaner to ignitor.	G716-8331266

b. CAMSHAFT AND VALVE GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
O-43	BEARING, sleeve: steel back babbitt-lined; 1.135″ lg x 2.321″ OD x 2.198″ ID; Willys part No. 639051.	Camshaft front bearing.	G503-7371156
O-44	CAMSHAFT: alloy iron; 19.2187″ lg x 2.186″ max dia; turns on four brg journals; key way for timing gear, end tapped for gear mtg screw; 12 tooth distributor and oil pump drive gear integral; Willys part No. 641284.	Engine camshaft.	G503-7741418
H78	COLLAR, spacing: steel; ring shaped; 1-19/32″ OD x 1-17/64″ ID x .187″ thk; one inside edge beveled 45°; Willys part No. 641049.	Camshaft thrust-plate spacer.	G503-7741407
O-45	GEAR: spur type; steel hub, lam bakelite; 56 helical teeth; 6.600″ OD x 1.250″ ID x 1.875″ thk; keyway for mtg to camshaft; Willys part No. 641283.	Camshaft timing gear.	G503-7741419
O-15, O-16, O-17, O-18	GUIDE, valve: cast-iron; 2.1875″ lg x .6565″ OD x .375″ ID; pressed into place in cyl. block; one end tapered to .53125″ dia w/.3125″ d x .399″ dia recess; other end .633″ dia x 1″ lg w/.03125 x 60° countersink; Willys part No. 119137.	Engine exhaust valve guides.	G503-7520738
O-11, O-12, O-13, O-14	GUIDE, valve: cast-iron; 2.750″ lg x .6565″ OD x .375″ ID; one end .620″ OD x .375″ lg w/.03125″ x 60° countersink; other end .633″ OD x 1″ lg w/.03125″ x 60° countersink; Willys part No. 637045.	Engine intake valve guides.	G503-7520739
H69	KEY, machine: Woodruff #9; steel; 3/16″ lg x 3/4″ wd; Willys part No. GM 124549.	Timing gear to camshaft key.	H001-0518022
H53, H54, H55, H56, H57, H58, H59, H60	LOCK, valve spring retainer: semicircular shaped; hardened steel; .499 to .503″ max OD, .399 to .343″ max ID, .372 to .382″ h; Willys part No. 643334.	Engine intake and exhaust valve retainer keys.	G716-8329519

Ref symbol	Name of part and description	Function of part	Stock No.
H77	PLATE, thrust: phosphor bronze; oval shape; 3.8125″ lg x 2.250″ wd x .182″ thk; two 13/32″ dia mtg holes, 3-3/16″ c to c; 1-21/32″ dia ctr opening; Willys part No. 802576.	Camshaft thrust plate.	G70-7351413
O-27, O-28, O-29, O-30, O-31, O-32, O-33, O-34	ROTOCAP, valve rotor assembly: hardened steel; 1.391 max dia x .826 to .831″ dia shoulder for valve spring; .485″ ga dia (ID) tapering 14°, 15 min; .405 to .455″ max thk; slips over valve stem, held in place by two sect. machine key; special rotocap type, allows rotation of valve by tappet action; Thompson Prod part No. F.R.-RA-58-A.	Engine intake and exhaust valve spring retainers.	G716-8329518
H61, H62, H63, H64, H65, H66, H67, H68	SCREW, tappet adjusting: steel; Willys part No. 640020.	Valve tappet adjustment screws.	G503-7371258
H71	SCREW, machine: hex. head; steel; 7/16″-14 NCT, class 2 fit; 1-1/8″ total lg; 1″ lg thd; Willys part No. GM 122260.	Camshaft gear retaining screw.	H001-5421941
H73, H74	SCREW, machine; hex. head; steel; 3/8″-16 NCT, class 2 fit; 3/4″ lg o/a; threaded full lg; Willys part No. GM 122119.	Thrust-plate screws.	H001-5420521
O-19, O-20, O-21, O-22, O-23, O-24, O-25, O-26	SPRING: helical compression type; 5/32″ dia spring steel wire; 2-1/2″ lg x 1-3/16″ dia; 9-3/8 turns; flat ends, one end close wound; Willys part No. 638636.	Valve closing springs.	G503-7371235
O-35, O-36, O-37, O-38, O-39, O-40, O-41, O-42	TAPPETT, valve: steel; approx 3-17/32″ lg w/adjusting screw assembled; approx 1-5/16″ dia base; Willys part No. 647072.	Transfer action of cam to valve stem.	G740-7372585
O-35, O-36, O-37, O-38, O-39, O-40, O-41, O-42	TAPPETT, valve: steel; approx 3-17/32″ lg w/adjusting screw assembled; approx 1-5/16″ dia base; .004 oversize; Willys part No. 115948.	Valve tappet repair, oversize.	G503-7743569
O-7, O-8, O-9, O-10	VALVE, engine exhaust: steel; 1.463 to 1.473″ dia head, .076 to .086″ thk gage line; stem, 5.820″ to 5.835″ lg o/a, .371″ to .372″ dia. embossed "EX" Willys 26″ on head; Willys part No. 807342.	Engine exhaust valves.	G716-8329517
O-3, O-4, O-5, O-6	VALVE, engine intake: steel; 1.525″ to 1.535″ dia head, .076 to .086″ thk gage line; stem, 5.820″ to 5.835″ lg o/a, .372 to .373″ dia; embossed "IN" on under side of head; Willys part No. 807341.	Engine intake valves.	G716-8329516
H75, H76	WASHER, lock: steel; .384″ ID x .694″ OD x .035″ thk; shakeproof-type, twisted external teeth; cup shaped; Willys part No. GM 138489.	Camshaft thrust-plate screw lock-washers.	H001-7017681
H72	WASHER, lock: steel; 7/16″ ID x 3/4″ OD x approx 1/32″ thk; shakeproof-type, twisted external teeth; cup shaped; Willys part No. GM 136857.	Timing gear mounting screw lock-washer.	H001-7017711

c. CARBURETOR GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
H365	ARM: 14 ga sheet steel; 1-9/16″ lg x 5/8″ wd x 3/8″ thk; 1/4″ dia hole in double end; one end bent 180° on 7/64″ rad, split to provide clamp action; other end w/5/32″ hole for choke rod; Okeefe and Merritt part/dwg No. 121358.	Carburetor choke operating arm.	G716-7033636
O-103	ARM, pump: pump arm and collar; steel; irregular shaped; 9/32″ dia mtg hole in collar; Cartercarb part No. 53A-168S.	Pump plunger lifting arm.	G503-7378104
H361	AXLE: 7/8″ lg x 3/32″ dia; presses into prongs under fuel bowl cover; Cartercarb part No. 24-23.	Carburetor float axle.	G507-5346740
O-108	CARBURETOR: down draft type; white metal die-cast and cast-iron; 6-5/8″ h x 4-1/4″ wd x 3-1/4″ thk; two 13/32″ dia mtg holes 2-3/8″ c to c; equipped w/h altitude jet; Cartercarb part No. WO-936S.	Meters and mixes fuel and air for combustion.	G716-8331257
H359	CLIP: hair-pin type; steel wire, zinc pl; .3437″ lg x .1875″ wd x .028″ dia wire; Cartercarb part No. 150A-10.	Retainer clip for metering rod, throttle connecting rod, and pump connector link.	H102-0142581
H375	CLIP: retainer; sheet steel; 19/32″ lg x 5/16″ h x 5/16″ wd; 1/8″ max jaw opening; 5/32″ dia hole, one end; Cartercarb part No. 172-21.	Holds throttle connector rod in place.	G503-7347754
O-106	FLOAT, carburetor: brass; 2-5/16″ lg x 1-3/8″ h x 1″ thk float chamber; two 3/32″ dia holes for axle; lever extends 13/16″ from float body; Cartercarb part No. 21-74S.	Carburetor float.	G503-7378058
H362	GASKET: fiber; 8 holes; irregular shaped, 2-29/32″ lg x 2-13/32″ wd x .032″ thk; Cartercarb part No. 121-73.	Carburetor float bowl cover gasket.	G503-7378090
H650	GASKET, set: c/o two #1A-56 flange gasket, one #1A-65 flange ins gasket, three #20-22 seat and plug gasket, three #20-26 jet and plug gasket, one #20-45 nozzle gasket, one #20-61 strainer gasket, two #121-56 body gasket, one #121-74 bowl gasket; gasket set for Cartercarb No. WO-936S; Cartercarb No. 184-A.	Carburetor gasket set.	G716-8331255
H651	GASKET, set: c/o one #20-22 needle seal gasket, one #20-35 strainer nut gasket (fuel inlet), one #20-61 strainer plug gasket (pump), one #121-137 body flange gasket, one #121-138 bowl cover gasket (air horn); gasket set (service) for Cartercarb No. WO-936S; Cartercarb part No. 188.	Carburetor gasket service kit.	
H384	INSULATOR, ring: cir shape w/mtg ears; white metal die-casting; 3-7/32″ lg across mtg ears x 1/8″ thk x 1-23/32″ ID; two 1/4″ dia mtg holes 2-23/32″ c to c; one 1/4″ dia hole outside of ring for jet; Cartercarb part No. 183-19.	Insulator for spacing between bowl and flange body.	G503-7702733
H360	LEVER: 16 ga sheet steel; L-shaped; 1-1/8″ lg x 3/8″ wd x 3/8″ h; one 10-32 NF-2 hole for mtg to choke oper arm; 1/2″ lg x 1/8″ wd slot for manual choke rod; Okeefe and Merritt part/dwg No. 121330.	Carburetor choke lever extension.	G716-7039035
O-102	LEVER: steel; irregular shaped; 9/32″ dia mtg hole in collar; Cartercarb part No. 53A-251S.	Carburetor pump operating lever.	G503-7378106
H394	LEVER, extension arm: 16 ga steel; irregular shaped; 1-15/32″ lg x 17/32″ wd x 7/16″ thk; one .196″ dia hole for mtg to carburetor throttle shaft and lever assy; 1/4″ x 3/16″ tab bent 90° for holding stationary; 1/8″ x 3/4″ slot on one side for connecting manual throttle cable; Okeefe and Merritt part/dwg No. 121329.	Carburetor manual throttle extension arm.	G716-8331252
H364	LINK, lever: steel; U-shaped; 5/8″ lg, 1/8″ dia rod; one arm 7/16″ lg, other arm 3/8″ lg; one end mts in 1/8 hole in pump arm; other end mts in pump plunger lifting arm and held in place by hair-pin type clip; one end grooved the circum of rod to hold hair pin clip; Cartercarb part No. 117-58.	Pump arm to pump connector link.	G503-5293071

c. CARBURETOR GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
H393	SCREW, adjustment: brass; Cartercarb part No. 30A-39.	Carburetor idle adjustment screw.	G503-7702610
H368	SCREW, adjustment: brass; Cartercarb part No. 37-30S.	High-speed adjusting screw.	G716-8330348
O-101	SHAFT: brass; 2-7/8″ lg x 1/4″ dia; slips into carburetor choke barrel; 1-5/8″ lg milled sect.; tapped holes 1-7/8″ c to c; Cartercarb part No. 13-85.	Carburetor choke shaft.	G716-7378051
O-111	SHAFT ASSEMBLY: incl throttle lever pl and rivet; brass shaft, steel lever pl; shaft 3-3/8″ lg x 5/16″ dia; lever pl 3″ lg x 2-1/8″ wd; shaft slips into carburetor throttle housing; one end of shaft flat on one side; milled sect. for throttle valve; Okeefe and Merritt part/dwg No. 121730.	Carburetor throttle shaft and lever.	G716-8331253
O-110	SPRING: helical compression; .040 dia steel wire; 1/2″ lg x 3/8″ dia; four turns; flat ends; Cartercarb part No. 61-57.	For carburetor idle adjusting screw.	G503-5293042
O-107	SPRING: helical compression type; .044″ dia steel wire; 1/2″ lg x 3/8″ dia; four turns; flat ends; Cartercarb part No. 36-17.	For high-speed adjusting screw assembly.	G716-8330349
H392	STRAINER: gasoline; square mesh .010″ between .002″ dia wires; 13/32″ lg x 5/16″ dia; cylindrical shaped: brass wire; Cartercarb part No. 30-20.	Fuel pump check strainer.	G085-3004900
H366	VALVE, needle: incl seat, needle, spring, spring pin and gasket; steel needle and spring; brass seat and pin; cylindrical shaped; 1-3/16″ lg x 3/8″ dia; 5/16″-24 thd 1/8″ lg; four 3/32″ dia radial holes, slotted for screw driver; Cartercarb part No. 25-93S.	Carburetor fuel inlet valve.	G503-7378061

d. CRANKSHAFT AND CONNECTING ROD GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
O-60, O-61, O-62, O-63	BEARING SET: steel back, babbitt-lined; ea set incl two sleeve brg, Willys part No. 639862; for 1.9385″ to 1.9375″ crank pin, 1.099″ wd; Willys part No. A-7233.	Connecting rod bearings.	G740-5701528
O-60, O-61, O-62, O-63	BEARING SET: connecting rod brg; steel back, babbitt-lined; ea set incl two sleeve brg, Willy part No. 116534; for 1.9385″ to 1.9375″ crank pin, 1.099″ wd .010 undersize; Willys part No. A-7234.	Connecting rod bearing, service kits, .010 undersize.	G740-5701529
O-60, O-61, O-62, O-63	BEARING SET: connecting rod brg; steel back, babbitt-lined; ea set incl two sleeve brg, Willys part No. 116535; for 1.9385″ to 1.9375″ crank pin, 1.099″ wd, .020 undersize; Willys part No. A-7235.	Connecting rod bearing, service kits, .020 undersize.	G740-5701530
O-60, O-61, O-62, O-63	BEARING SET: connecting rod brg; steel back, babbitt-lined; ea set incl two sleeve brg, Willys part No. 116536; for 1.9385″ to 1.9375″ crank pin, 1.099″ wd, .030 undersize; Willys part No. A-7236.	Connecting rod bearing, service kits, .030 undersize.	G740-5701531
O-59, O-64, O-65	BEARING SET: steel back, babbitt-lined; c/o ctr main upper insert brg No. 638730, ctr main lower insert brg No. 638731, front main upper brg No. 637007, front main lower brg No. 637008, rear main upper brg No. 638732, rear main lower brg No. 638733; "STD" stamped on back; Willys part No. A-6798.	Standard size bearing service kits.	G503-7371493
O-59, O-64, O-65	BEARING SET: for complete crankshaft, front, ctr, and rear brgs, steel back, babbitt-lined; flanged ends, .010 undersize, two oil grooves; Willys part No. A-6746.	Crankshaft bearing service kits, consist of front, center, and rear, .010 undersize.	G503-7521218
O-59, O-64, O-65	BEARING SET: for complete crankshaft, front, ctr, and rear brgs; steel back, babbitt-lined; flanged ends, .020 undersize, two oil grooves; Willys part No. A-6747.	Crankshaft bearing service kits, consist of front, center, and rear, .020 undersize.	G503-7371503

d. CRANKSHAFT AND CONNECTING ROD GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
O-59, O-64, O-65	BEARING SET: for complete crankshaft, front, ctr, and rear brg; steel back, babbitt-lined; flanged ends, .030 undersize, two oil grooves; Willys part No. A-6748.	Crankshaft bearing service kits, consist of front, center, and rear, .030 undersize.	G503-7371504
H88, H89, H90, H91, H92, H93, H94, H95	BOLT, machine: special head; steel; 3/8″-24 NFT, class 2 fit; 2-1/4″ lg o/a; threaded portion 5/8″ lg; 1/4″ thk head, rounded top, elliptical shaped; one side tapered; .125″ lg x .388″ dia next to head; .875″ lg x .390″ dia shoulder; Willys part No. 641768.	Connecting rod bolts.	G503-7744471
O-68	CRANKSHAFT ASSEMBLY: steel; 23-1/2″ lg x 9-1/4″ thk; mts on three main brg journals; alinement arrow stamped on flywheel flange; incl counterweights, flywheel bolts, nuts, and lockwashers; Willys part No. 647078.	Converts vertical motion of pistons into rotating motion.	G503-7744473
O-67	GEAR: spur gear; cast-iron; 28 helical teeth, left-hand; 3.401″ OD x 1.250″ ID x 1.200″ thk; key mtg; timing mark "O" on edge, 51°, 58 min to left of keyway; Willys part No. 641282.	Crankshaft timing gear.	G503-7741415
H101	KEY, machine: Woodruff #13; steel; 3/16″ x 1″; Willys part No. GM 124552.	Crankshaft gear key.	H101-0124552
H105, H106, H107, H108, H109, H110, H111, H112	NUT, hexagon: steel; 3/8″-24 NFT, class 3 fit; 21/64″ thk; 9/16″ across flats; Willy part No. 641769.	Connecting rod bolt nuts.	G503-7744472
H113, H114, H115, H116, H117, H118, H119, H120	NUT, lock: pal nut type; steel; 3/8″-24 NFT, class 3 fit; approx 3/16″ thk; 5/8″ across flats; inside hollow; Willys part No. GM 107828.	Connecting rod cap bolt locknuts.	H001-0726015
H96, H97, H98, H99, H100	PIN, dowel: steel; .34375″ lg, .311″ to .313″ OD; .0625″ lg x .247″ to .249″ dia one end, .343″ lg x .311″ dia other end; Willys part No. 635377.	Crankshaft bearing locating pins.	G503-7371229
O-51, O-52, O-53, O-54	PIN, wrist: steel; .003″ oversize; 2-25/32″ lg, .8147″ to .8149″ OD; .078″ d retainer groove on one side at ctr; Willys part No. 116003.	Piston pins, .003 oversize.	G503-7371145
O-47, O-48, O-49, O-50	PISTON, engine: metal ring, seal-type; aluminum, tin pl; standard size; two compression grooves, one oil ring groove and one open groove at top; 3.124″ OD, 3.750″ lg; slotted upper skirt, incl wrist pin; Willys part No. 801376.	Engine pistons.	G740-7372873
O-47, O-48, O-49, O-50	PISTON, engine: metal ring, seal type; aluminum type, tin pl; .020 oversize; two compression grooves, one oil ring groove and one open groove at top; 3.144″ OD, 3.750″ lg; slotted upper skirt incl wrist pin; Willys part No. 801538.	Piston and piston pin assembly service kits, .020 oversize.	G740-7372874
O-47, O-48, O-49, O-50	PISTON, engine: metal ring, seal-type; aluminum type, tin pl; .030 oversize; two compression grooves, one oil ring groove and one open groove at top; 3.154″ OD, 3.750″ lg; slotted upper skirt, incl wrist pin; Willys part No. 801539.	Piston and piston pin assembly service kits, .030 oversize.	G740-7372875

d. Crankshaft and Connecting Rod Group (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
O-47, O-48, O-49, O-50	PISTON, engine: metal ring, seal-type; aluminum type, tin pl; .040 oversize; two compression grooves, one oil ring groove and one open groove at top; 3.164″ OD, 3.750″ lg; slotted upper skirt incl wrist pin; Willys part No. 801540.	Piston and piston pin assembly service kits, .040 oversize.	G740-7372876
O-46	RING SET, piston: c/o four second groove compression rings; Willys part No. 639864; four third groove compression rings, Willys part No. 637042; four bottom groove oil regulating rings, Willys part No. 638242; for 3-1/8″ dia cyl, standard size; Willys part No. A-6794.	Seals between cylinder wall and piston.	G503-7371146
O-46	RING SET, piston: c/o four second groove compression rings; four third groove compression rings; four bottom groove oil regulating rings; for 3-1/8″ dia cyl, 3/16″ wd for oil rings and 3/32″ wd for compression rings, .020 oversize; Willys part No. A-6796.	Service package, piston ring .020 oversize.	G503-7330714
O-46	RING SET, piston: c/o four second groove compression rings; four third groove compression rings; four bottom groove oil regulating rings; for 3-1/8″ dia cyl, 3/16″ wd for oil rings and 3/32″ wd for compression rings, .030 oversize; Willys part No. A-6797.	Service package, piston ring .030 oversize.	G503-7371147
O-46	RING SET, piston: c/o four second groove compression rings; four third groove compression rings; four bottom groove oil regulating rings; for 3-1/8″ dia cyl, 3/16″ wd for oil rings and 3/32″ wd for compression rings, .040 oversize; Willys part No. A-15283.	Service package, piston ring, .040 oversize.	G503-7329277
O-55, O-56	ROD, connecting: for #1 and #3 cyl; incl cap, and four cap bolts No. 641768; steel; 12-3/4″ lg x 3-9/32″ wd x 1-11/32″ thk; two 3/8″-24 bolts and nuts for brg cap; oil spurt hole at large end, wrist pin end split; Willys part No. 641774.	Connect piston to crankshaft.	G503-7743751
O-57, O-58	ROD, connecting: for #2 and #4 cyl; incl cap, and four cap bolts No. 641768; steel; 12-3/4″ lg x 3-9/32″ wd x 1-11/32″ thk; two 3/8″-24 bolts and nuts for brg cap; oil spurt hole at large end, wrist pin end split; Willys part No. 641775.	Connect piston to crankshaft.	G503-7743752
H79, H80, H81, H82	SCREW, machine: hex. head; steel; 3/8″-24 NFT, class 2 fit; 1-5/32″ lg x 3/8″ lg thd; 1/4″ thk head; Willys part No. 632157.	Piston pin lockscrews.	G503-7324840
H87	SEAL: braided asbestos, jute ctr, graphited; rod shaped; 4-1/2″ lg, 11/32″ dia; Willys part No. 800093.	Crankshaft rear end oil seal.	G740-7372560
H102	SHIM: steel; washer shaped; 3.1875″ OD x 1.250″ ID x .002″ thk; Willys part No. 630262.	Crankshaft end-play regulation.	G503-7371226
H83, H84, H85, H86	WASHER, lock: steel; .688″ OD x .382″ ID x .094″ thk; split-ring type; Willys part No. GM 103321.	For piston pin lockscrews.	H001-7025741
H104	WASHER, thrust: steel; 3-3/16″ OD x 1-1/4″ ID x 1/8″ thk; ctr hole mtg; Willys part No. 634796.	Engine crankshaft thrust washer.	G503-7371160

e. Cooling System and Water Pump Group.

Ref symbol	Name of part and description	Function of part	Stock No.
O-163, O-164	BEARING, ball: single row radial; med duty; .6693″ bore, 1.5748″ OD x .563″ wd; 8 balls; packed w/MIL-G-3278 grease; New Departure Division of GM Corp part No. 8503.	Bearings for water pump.	3H320-29[a]
H480	BELT, "V": impregnated fabric; 3/16″ wd inside, 9/16″ wd outside, 1/2″ thk; 57-1/2″ outside circum; Gates Rub part No. 60RC71-41.	Engine fan and generator drive belt.	6Z879-29[a]

e. COOLING SYSTEM AND WATER PUMP GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
Q-139	CAP: radiator; brass and steel; 4 lb pressure release; 3-3/4″ OD across ears, 2″ ID, 2″ thk incl tab; twist lock design; Badger Tool and Mfg Co part No. PR-3S.	Radiator and pressure cap.	G716-8331388
H289, H290	CLAMP: aluminum; 7/8″ ID, 1-7/16″ from bottom to end of fastening prongs; 1/2″ wd; for 1/2″ ID x 7/8″ OD hose; Willys part No. GM 111605.	Hold bypass hose tight on nipple.	
H464, H465, H466, H467, H468, H469, H470, H471	CLAMP: SS band, alloy steel adj screw mechanism; one adjusting screw used; 2-1/4″ max dia, 1-3/4″ dia nom, 9/16″ wd band; slot-type take-up drive; Breeze part No. QS100-M24S.	Coolant system hose clamps.	H006-0502920
H477	COCK: removable screw plug; brass; T-handle; single 1/2″ male pipe thd; 1″ extension for attaching 5/8″ ID drain hose; approx 2-5/8″ lg o/a; Okeefe & Merritt part/dwg No. 122332.	Special radiator drain valve.	
H281	GASKET: treated paper and fiber; five holes; irregular shaped, 5-7/8″ lg x 4-1/4″ wd x 1/32″ thk; four 11/32″ dia holes, one 3-1/16″ dia hole; Willys part No. 637053.	Engine water pump mounting gasket.	G716-7411250
H288	HOSE: rubber; 1/2″ ID, 7/8″ OD, 2-3/8″ end to ctr on longest end; bent 90°; Willys part No. 649719.	Pump to cylinder head, water bypass line.	
H474	HOSE: syn rubber and impregnated cotton braid; cylindrical; 6″ lg x 1/2″ ID x 23/32″ OD; slips over radiator drain cock extension tube end; Okeefe & Merritt part/dwg No. 122420.	Drain valve extension hose for draining radiator.	G716-8331224
H462, H463, H473, H478	HOSE, rubber: rubber w/fabric reinforcement; 1-3/4″ OD x 36″ lg; Goodrich BF Spec MIL-H-6000.	Radiator hoses.	H007-0100170
H462	HOSE: 1-3/4″ OD x 1-1/2″ ID x 3″ lg; Goodrich BF Spec MIL-H-6000; Okeefe & Merritt part/dwg No. 121718.	Water pump inlet hose.	
H463, H473	HOSE: 1-3/4 OD x 1-1/2″ ID x 2-1/2″ lg; Goodrich BF Spec MIL-H-6000; Okeefe & Merritt part/dwg No. 122080.	Radiator inlet hoses.	
H478	HOSE: 1-3/4″ OD x 1-1/2″ ID x 4-1/2″ lg; Goodrich BF Spec MIL-H-6000; Okeefe & Merritt part/dwg No. 122079.	Radiator outlet hose.	
O-79	IMPELLER: cast-iron; 2-61/64″ dia at large end, 9/16″ ID, 2-15/16″ lg; presses onto shaft; six blades; Willys part No. 639993.	Engine water pump impeller.	G503-7371383
H652	MAINTENANCE PARTS KIT: for Okeefe & Merritt water pump No. 122528; c/o one #800003 water pump seal washer, one #801048 water pump seal assy, one #637053 water pump to cyl block gasket; Willys part No. 802039.	Water pump seal repair kit.	G740-7697590
H286, H287	PIPE: galv wrought iron; 1/4″ trade size; one end not threaded, other end standard 1/4″ pipe thd; approx 1-1/4″ lg; Willys part No. 649720.	Nipples for water bypass hose.	G740-7372808
O-141	PULLEY: V-type; aluminum cast over steel bushing; 8-5/8″ dia, 1-7/8″ thk; 5/8″ ID, 1-3/16″ deep bore; one groove, 1/2″ wd x 5/8″ d; 36° V; pulley presses onto water pump shaft; Okeefe & Merritt part/dwg No. 121863.	Fan and water pump pulley.	G716-8331344
O-81	PUMP, liquid centrifugal: belt driven; horizontal mtg; 1-1/2 OD inlet pipe for hose; 7-1/8″ lg x 5-31/32″ wd x 4-7/32″ h; single groove pulley 8-5/8″ dia x 1-7/8″ wd V-pulley for 3/16″ x 9/16″ wd V-belt; cast-iron construction; four 11/32″ dia mtg holes, three on one side irregular spaced, one hole 5-1/8″ c to c from middle hole on opposite side; Okeefe & Merritt part No. 122528.	Engine coolant pump.	

e. COOLING SYSTEM AND WATER PUMP GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
A39	RADIATOR, cooling system: terne pl steel and brass construction with cast-iron elbow at bottom; 23″ h incl studs, 21-3/16″ wd incl studs, 5-5/16″ thk; two 3/8″-16 studs x 3/4″ lg on bottom of radiator spaced 10″ c to c; five 1/4″-20 x 1/2″ lg welding bolts on side; McCord part No. DA202600.	For engine cooling.	G716-8331379
H283, H284, H285	SCREW, machine: hex. head; steel; 5/16″-18 NCT, class 2 fit; 7/8″ lg; 3/4″ lg thd; 17/64″ thk, 1/2″ across flats; incl one 5/16″ split-ring lockwasher; Willys part No. 673488.	Fasten water pump to cylinder block.	G740-7372812
H291	SCREW, machine: hex. head; steel; 5/16″-18 NCT, class 2 fit; 2-1/2″ lg; 1-7/8″ lg thd; 15/64″ thk, 1/2″ across flats; incl one 5/16″ split-ring lockwasher; Willys part No. 800232.	Fastens water pump to cylinder block.	G740-7372813
O-80	SHAFT: SS; 5-5/16″ lg x 7/8″ OD; Okeefe & Merritt part/dwg No. 122801.	Water pump shaft.	
O-165	SLEEVE, spacer: seamless tubing; 7/8″ OD x .6851″ ID x .840″ lg; Okeefe & Merritt part/dwg No. 122802.	Water pump bearing spacer.	
H472	TUBE, water: straight, 1-1/2″ OD x 7″ lg; 18 gage solid wall steel tubing, galv; straight ends; Okeefe & Merritt part/dwg No. 121381.	Cylinder head to radiator outlet connection.	G716-7411248
H479	TUBE, water: 1-1/2″ OD x 6″ lg; 18 gage solid wall steel tubing; straight ends; 90° bend; Okeefe & Merritt part/dwg No. 121398.	Radiator outlet connection.	G716-7089992
H475, H476	WEBBING: cotton, asphalt treated; 1/8″ thk; 3-1/2″ lg x 2″ wd; Okeefe & Merritt part/dwg No. 121327.	Radiator mounting shock and spacer pads.	

f. CYLINDER BLOCK GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
O-2	FITTING, oil: timing gear; hex. shape; 1-1/2″ lg x 7/16″ hex.; mts by 1/8″ male pipe thd on one end; Willys part No. 641050.	Timing gear oiler.	G740-7372557
H5	GASKET: treated paper and fiber; triangular shaped, 4-1/8″ lg x 3-5/8″ wd x .072 thk; Willys part No. 639650.	Cylinder head water outlet elbow gasket.	G503-7531612
H38	GASKET: steel clad asbestos; 4 cyl openings; 41 holes; rectangular shape, 16-11/16″ lg x 7-1/8″ wd x 1/16″ thk; Willys part No. 638540.	Cylinder head gasket.	G503-7741412
H653	GASKET SET: c/o Willys 1 chain cover gasket No. 630365, 1 cylinder block front gasket No. 641096, 1 cylinder head gasket No. 638540, 1 exhaust flange gasket No. 634814, 2 fuel pump to cylinder block gaskets No. 638737, 1 intake & exhaust manifold gasket No. 638640, 1 intake to exhaust manifold gasket No. 634811, 1 oil float support gasket No. 630398, 1 oil pan gasket No. 639980, 1 oil pump cover gasket No. 641482, 1 oil pan drain plug gasket No. 640030, 1 oil pump to cylinder block gasket No. 646147, 1 oil relief spring retainer gasket No. 634813, 1 valve spring cover gasket No. 630305, 2 valve cover screw gaskets No. 51875, 1 ventilator to valve cover gasket No. 630299, 1 water outlet elbow gasket No. 639650, 1 water pump to cylinder block gasket No. 637053, 2 rear bearing cap packings No. 800093, 2 rear bearing cap packings No. 637790, 1 oil seal No. 643839 (optional w/647468); packaged in mp container; Willys part No. 648054.	Gasket set for complete engine overhaul.	G740-7372555

f. CYLINDER BLOCK GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
H654	GASKET SET: c/o Willys 1 cylinder head gasket No. 638540, 1 exhaust flange gasket No. 634814, 1 intake & exhaust manifold gasket No. 638640, 1 intake to exhaust manifold gasket No. 634811, 2 valve cover screw gaskets No. 51875, 1 valve spring cover gasket No. 630305, 1 ventilator to valve cover gasket No. 630299, 1 water outlet elbow gasket No. 639650; packaged in mp container; Willys part No. 648055.	Gasket set for valve grinding.	G740-7375027
A2	HEAD, cylinder: L-type; cast iron; 16-13/16″ lg x 7-1/8″ wd x 2-9/64″ thk; 15 holes for 7/16″ dia studs; Willys part No. 807763.	Cylinder head.	G716-8329515
H11, H12, H13, H14, H15, H16, H17, H18, H19, H20, H21, H22, H23, H24, H25	NUT, hexagon: steel; 7/16″-20, NFT, class 2 fit; 7/16″ thk; 11/16″ across flats; Willys part No. 638539.	Cylinder head stud nuts.	G503-5333811
H51, H52	PACKING: rubber; cylindrical shape; 2.203″ lg x .360″ dia; Willys part No. 637790.	Crankshaft rear bearing cap packings.	G503-7371281
H39, H40, H41, H42, H43	PLUG, expansion: for 1-1/4″ hole; 1-1/4″ dia x 1/16″ thk; Willys part No. GM 103895.	Cylinder block core hole plugs.	H006-0282480
H44	PLUG, expansion: for 1-3/4″ hole; 1-3/4″ dia x 1/16″ thk; Willys part No. GM 103897.	Rear camshaft bearing expansion plug.	H006-0282510
H6	RETAINER, thermostat: 16 ga steel, tin pl; circular shaped; 2-5/16″ OD x 1-13/16″ h; Willys part No. 639651.	Engine thermostat adapter to outlet elbow.	G503-7371386
H10	RING, adapter: 16 ga steel; 2-5/16″ OD x 19/32″ h; Okeefe & Merritt part/dwg No. 121347.	Engine thermostat retainer.	G716-7036599
H45, H46, H47, H48, H49, H50	SCREW, machine: hex. head, semifinished; steel; 1/2″-13, NCT, class 2 fit; 2-3/8″ lg o/a; thd 1-3/8″ lg; Willys part No. 381519.	Crankshaft bearing cap screws.	G503-7371227
H1, H2, H3	SCREW, machine: hex. head; 3/8″-16, NCT, class 2 fit, 1″ min lg; 1-1/8″ lg; 1″ lg thd; incl 3/8″ split ring lockwasher; Willys part No. 800229.	Water outlet elbow to cylinder head bolt and lockwasher assembly.	G740-7697587
H26, H27, H28, H29, H30, H31, H32, H33, H34, H35, H36, H37	STUD: steel; 3-3/8″ lg x .400″ dia; 7/16″-14, NCT, class 2 fit, 5/8″ min lg; other end, 7/16″-20, NFT, class 2 fit, 13/16″ min lg; Willys part No. 802548.	Cylinder head studs.	G740-7348512
H7, H8, H9	STUD: steel; 3-7/8″ lg x .400″ dia; one end, 7/16″-14, NCT, class 2 fit, 5/8″ min lg; other end, 7/16″-20, NFT, class 2 fit, 13/16″ min lg; Willys part No. A-1548.	Cylinder head studs.	G503-7371138
O-1	VALVE, thermostatic: brass and copper; straight type, opens at approx 180° F; approx 2-5/32″ lg x 2-1/8″ dia; Harrison Radiator Division of GM Corp part No. 3122285.	Controls engine coolant.	G249-7531600

g. FUEL SYSTEM AND FILTER GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
H335	CAP: c/o retainer pin Okeefe & Merritt No. 122017, cap Okeefe & Merritt No. 122532, rivet, oval head, 1/8" dia x 9/32" lg, chain, steel sash, No. 40; cap hex. shape; cap size 5/16" tube thd; assy approx 6-1/2" lg; cap screws on to half-union fitting on fuel connection adapter plate, assy retained by cotter in thru generator mtg support; Okeefe & Merritt part/dwg No. 122461.	Covers fuel connection fitting when auxiliary fuel line is disconnected.	G716-8331271
H340	CLEANER ELEMENT, fuel: laminated brass disk; reusable; cylindrical, 2-1/32" dia o/a, 2-1/8" h o/a; p/o AC Spark Plug Division of GM Corp filter type T-2; AC Spark Plug Division of GM Corp part No. 1595654 type T-12.	Fuel filter cleaner element.	G716-8331260
H327, H328	FITTING, pipe: bushing; brass; size 3/8" x 1/8" pipe; Imperbrass part No. 110-B.	Fuel filter adapters.	H006-0210060
H321, H333	FITTING, pipe: bushing, brass; size 3/8" x 1/4" IPS; Imperbrass part No. 110-B.	Connect adapter plate to auxiliary fuel line and fuel filter.	H006-0210060
H322	FITTING, tubing: 90° elbow; brass; for 5/16" dia tube; 1/2"-20 male thd for inverted flare tube one end, 1/4" IPS male other end; nuts and ferrules not incl; Imperbrass part No. 49-F.	Connects fuel line from auxiliary connection to fuel filter.	
H317, H330	FITTING, tubing: 90° elbow; brass; for 1/4" tubing; 7/16"-24 female inverted flared tube one end, 1/8" male IPS other end; nuts and ferrules not incl; 2 parallel sides for wrench attachment; Imperbrass part No. 49-W.	Fuel filter and engine fuel pump elbows.	H006-0260807
H323	FITTING, pipe: 1/8" female x 1/8" male x 1/8" female; Imperbrass part No. 127-B.	Connects heater electric pump and primer lines to fuel filter.	
H331, H334	FITTING, tubing: male connector; brass; for 5/16" tube; 5/16" tube one end, 1/4" IPS other end; nuts and ferrules not incl; hex. portion for wrench attachment; Imperbrass part No. 48-F.	Connect fuel lines leading to auxiliary adapter plate.	
H311, H325	FITTING, tubing: 90° inverted flared tube fitting; brass; u/w 5/16" tubing; 5/16" inverted flare tube one end, 1/8" male IPS other end; nuts and ferrules not incl; 2 parallel sides for wrench attachment; Imperbrass part No. 49-W.	Elbows connecting line from fuel pump to carburetor.	H006-0260850
H655	GASKET SET: c/o AC 853562, AC 853558, and AC 853572.	Provides repair parts.	G508-7702585
H312, H316	KEEPER: 1/4" brass rod; cylindrical; 5/16" lg x 1/4" dia; mts w/.136" dia, 9/32" d hole and .078" dia hole thru one end for wire, secured by means of standard screw; Okeefe & Merritt part/dwg No. 121332.	Manual throttle and choke control wire stops, or keeper and screw.	G716-8331339
H342	LINE, fuel: straight tube 7/16" OD x 1/4" ID x 5" lg; one end 3/8" SAE swivel nut tube fitting, other end w/no fitting; hose stamped w/part No.; u/w AC Spark Plug Division of GM Corp fuel filter part No. 5572853; Okeefe & Merritt part/dwg No. 122404.	Fuel filter drain hose assembly.	G716-8331262
H326	LINE, fuel: straight flex tube 1/4" ID x 7/16" OD x 18-1/2" lg; 7/16"-24 thd male inverted flare swivel fitting one end, 1/8" IPS male thd other end; Okeefe & Merritt part/dwg No. 122399.	Fuel filter to engine fuel pump line.	G716-8331268
H313	LINE, fuel: straight flex tube 1/4" ID x 7/16" OD x 33-1/2" lg; 7/16"-24 thd male inverted flare swivel fitting both ends; Okeefe & Merritt part/dwg No. 122401.	Fuel filter to heater electric pump line.	G716-8331269
H329	LINE, fuel: straight flex tube 5/16" ID x 17/32" OD x 7-3/4" lg; 1/2"-20 thd female inverted flare swivel fitting ea end; Okeefe & Merritt part/dwg No. 122411.	Fuel line connecting auxiliary connection to fuel filter.	G716-8331270
H315	LINE, fuel: preformed 5/16" OD, 19-1/4" lg o/a; SS .032" wall thickness; Weatherhead part No. 105X5 inverted nut for 5/16" tube ea end; Okeefe & Merritt part/dwg No. 122028.	Fuel line connecting fuel pump to carburetor.	G716-8331389

g. FUEL SYSTEM AND FILTER GROUP (contd)

Ref symbol	Name of part and description	Function of part	Stock No.
H319	LINE, fuel: 10-3/4″ lg o/a, 1/8″ dia, .030″ wall, soft drawn round seamless copper tubing; Dole No. BU000 compression fitting at ea end; Okeefe & Merritt part/dwg No. 121665.	Connects primer tee to manifold elbow assembly.	G716-8331220
H324	LINE, fuel: straight flex tube 1/4″ ID x 7/16″ OD x 11″ lg; 7/16″-20 female swivel fitting for SAE flared connector one end, 1/8″ IPS male thd other end; Okeefe & Merritt part/dwg No. 122405.	Fuel filter to engine primer line.	G716-8331338
H314	LINE, fuel: 42″ lg o/a, 1/8″ dia, .030″ soft drawn, round seamless copper tubing; Dole No. BU-000 compression fitting, ea end; Okeefe & Merritt part/dwg No. 122403.	Primer to primer tee tubing assembly.	G716-8331219
H320	NOZZLE: tee; brass; T-shaped; 1-1/2″ running lg; 1-1/8″ lg at side outlet, 1/2″ thk; thd 1/4″ male pipe for mtg in manifold; 2 ends 1/8″ compression type tubing connections; Dole part No. PR-20-1100.	Engine primer tee for intake manifold.	G741-7374842
H318	NOZZLE: brass; 1-1/8″ lg a nozzle end, 1″ lg at tubing end, 1/2″ thk; thd 1/4″ male pipe for mtg in manifold; one end 1/8″ compression type tubing connection; Dole part No. PR-20-700.	Engine primer elbow for intake manifold.	3H3985N.7[a] G740-7053669
A17	PLATE, adapter: steel; 2-1/2″ lg x 2-1/2″ wd x 1″ thk; secured to unit thru four 9/32″ dia mtg holes located on ea corner and spaced 2″ c to c; Imperbrass reducing bushing 1/4″ x 3/8″, part No. 119-B silver soldered to plate; Okeefe & Merritt part/dwg No. 122531.	Fuel supply coupling adapter plate.	G716-8331272
O-89	PUMP, liquid plunger: hand driven; horiz mtg; 1/4″ inlet, 1/8″ tube outlet; compression type connections; approx 7-1/2″ lg x 5/8″ dia body, 2″ dia knob; brass; 3/4″-27 thd sleeve w/face plate and locknut to mt on panel; assy incl a ball check valve w/hose fitting; Okeefe & Merritt part/dwg No. 121462.	Supplies raw fuel to intake manifold for cold starting.	3H4601-54[a]
O-88	ROD, choke: flex wire and sleeve type; .072 dia wire rod w/wnd brass wire sleeve; 22-25/32″ lg incl knob, 1-3/8″ dia knob; 3/8″ sleeve mts thru panel w/3/8″-24 NF locknut; Arens Controls, Inc part No. F6069-69.	Manual choke control.	3H0500-21[a]
O-90	ROD, control: flex wire and sleeve type; .063″ dia SS rod, flex braided steel casing; 44″ lg incl knob, 2″ dia knob, 1-1/2″ lg; 9/16″ sleeve mts thru panel w/9/16″-18 NF locknut; rod locks in place by turning pull knob; Okeefe & Merritt part/dwg No. 122635.	Manual throttle control.	3H5055.9[a]
H336	SCREW, machine: hex. head; steel; 3/8″-24, NFT, class 2 fit, 7/8″ min lg; 1-1/4″ lg; 7/8″ thd; 3/4″ head across flat; shoulder dimen 7/16″ dia, 1/8″ lg, 45° chamfer; dimen of screw end not thd 1/4″ lg, 5/16″ dia, 45° chamfer; p/o AC Spark Plug Division of GM Corp filter type T-2; AC Spark Plug Division of GM Corp part No. 853634.	Hold down filter cover.	G501-5291728
O-91	SPRING: helical compression; approx 3/64″ dia wire; 1-3/4″ free lg, 17/32″ ID; 7 turns; flat ends; cylindrical shape; p/o AC Spark Plug Division of GM Corp filter T-2; AC Spark Plug Division of GM Corp part No. 1504249.	Fuel filter disk compression spring.	G104-1789600
H341	VALVE, gate: brass or bronze; lever handle; 1/4″ IPS to fuel filter, 3/8″ dia for tubing connection; approx 1-7/16″ lg o/a between attachment fittings; greased w/low temperature grease; Imperbrass part No. SAE 57.	Fuel filter drain valve.	G716-8331263

h. FUEL PUMP GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
H356	ARM: p/o AC Spark Plug Division of GM Corp fuel pump No. 1539716; hardened steel; 2-7/8″ lg x 3/4″ wd x 1/4″ thk; one 17/64″ dia hole for pin; steel layers riveted together; AC Spark Plug Division of GM Corp part No. 1521960.	Fuel pump rocker arm.	G503-7735738

h. FUEL PUMP GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
H343	BAIL, assembly: wire bail type; p/o AC Spark Plug Division of GM Corp fuel pump No. 1539716; steel; 3″ lg x 2-3/4″ wd x 1/8″ dia wire; ends slot-mounted in pump body w/top seating on bowl; AC Spark Plug Division of GM Corp part No. 1523231.	Fuel pump bowl retainer.	G085-3000180
H344	GASKET: cork; one hole; circular shape; 2-1/4″ OD x 1-13/16″ ID x 3/32″ thk; p/o AC Spark Plug Division of GM Corp fuel pump No. 1539716; AC Spark Plug Division of GM Corp part No. 1523096.	Fuel pump bowl.	G085-3002220 3H4552C/564[a]
H354	GASKET: treated paper; three holes; triangular shape, 2-9/16″ h x 2-9/16″ wd; AC Spark Plug Division of GM Corp part No. 838263.	Fuel pump to cylinder block gasket.	G503-5261672 3H4601-51G1[a]
H656	MAINTENANCE PARTS KIT: for AC Spark Plug Division of GM Corp fuel pump, part No. 1539716; c/o 1 pull rod & diaphragm assy No. 5592434; 1 diaphragm spring No. 5592480, 1 diaphragm gasket No. 855559, 2 valve assemblies No. 5591860, 1 gasket No. 1537404, 1 rocker arm spring No. 1522046, 1 rocker arm pin No. 1521578, 1 washer No. 1521288, 1 link No. 1521708, 1 gasket No. 1523096, 1 screen assembly No. 1523099, 1 gasket No. 838263; AC Spark Plug Division of GM Corp part No. 5592853.	Fuel pump low-temperature repair kit.	G716-8331251
O-99	PUMP, liquid diaphragm: cam operated lever drive; incl filtering screen assy; 6-3/8″ h x 3-3/16″ dia; 1/8″-27 (Dryseal) straight female pipe thd two .323″ dia mtg holes spaced 1-3/4″ c to c; has manual priming lever; AC Spark Plug Division of GM Corp part No. 1539716.	Engine fuel pump.	G716-8328020
H345	RETAINER, spring: holds spring in place on under side of diaphragm; p/o AC Spark Plug Division of GM Corp fuel pump No. 1539716; 1/64″ thk steel; cup washer shaped; 1-5/8″ OD x 17/32″ ID x 1/8″ thk o/a; ctr hole mtg over diaphragm pull rod; AC Spark Plug Division of GM Corp part No. 1522072.	Diaphragm spring retainer.	
H349, H350	SCREW, machine: hex. head; steel; 5/16″-18, NCT, class 2 fit, 7/8″ min lg thd; 7/8″ lg; 7/8″ lg of thd; Willys part No. GM 106325.	Fuel pump to engine block mounting screws.	H001-5419160
H346	STRAINER: gasoline feed; 120 mesh copper screening; round brass rim; 1-1/2″ dia x 5/16″ h; 1-1/16″ ID rim; AC Spark Plug Division of GM Corp a-c fuel pump No. 1539716; AC Spark Plug Division of GM Corp part No. 1523099.	Fuel pump filter.	G085-3004880
H351, H352	WASHER, lock: steel; .591″ OD x .319″ ID x .078″ thk; split ring type; Willys part No. GM 120214.	Fuel pump to cylinder block mounting lockwashers.	H001-7025711

i. GEAR COVER AND FLYWHEEL GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
H194, H195, H196	BOLT, machine: hex. head; steel; 3/8″-16, NCT, class 2 fit, 3/4″ min lg; 3/4″ lg; 3/4″ lg thd; std; Willys part No. GM 100133.	Mount engine plate to cylinder block.	H001-5420520
H161, H162, H163	BOLT, machine: hex. head; steel; 3/8″-24, NFT, class 2 fit, 3/4″ min lg; 3/4″ lg; 3/4″ lg thd; std; Willys part No. GM 123520.	Mount timing gear cover to engine plate.	H001-5421221
H191	BOLT, machine: hex. head; steel; 3/8″-24, NFT, class 2 fit, 1″ min lg; 1″ lg; 1″ lg thd; std; Willy part No. GM 120647.	Mounts timing gear cover to engine plate.	H001-5421261
H201	GASKET: treated paper and fibre; 10 holes; irregular shape, 9.75″ lg x 8.3125″ wd x .011″ thk; elliptical shaped opening 4″ x 3″; Willys part No. 641096.	Engine front end plate to cylinder block gasket.	G503-7741427

i. GEAR COVER AND FLYWHEEL GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
H193	GASKET: cork; 9 holes; oval shaped, 13-1/4″ lg x 8-3/4″ wd x 1/16″ thk; eight 13/32″ mtg holes; Willys part No. 630365.	Timing gear cover gasket.	G503-7371159
O-72	GEAR: spur type; steel; 124 straight teeth; 12.422″ OD x 10.982″ ID x 3/8″ thk; press mts to flywheel; Willys part No. 641955.	Flywheel ring gear for starter engagement.	G740-7372583
H160	KEY, machine: Woodruff #9; steel; 3/16″ lg x 3/4″ wd; Willys part No. GM 124549.	Locks crankshaft pulley to crankshaft.	H001-0518022
H175, H176, H177, H178, H179, H180, H181, H182, H183, H184	NUT, hexagon: steel; 3/8″-24, NFT, class 2 fit; 5/16″ thk; 17/32″ across flats; Willys part No. GM 120369.	Mounting nuts for bolts and studs.	H001-4167601
H214, H215, H216, H217, H218, H219, H220, H221	NUT, hexagon: steel; 3/8″-24, NFT, class 2 fit; .331″ thk; .625″ across flats; Willys part No. GM 103026.	For flywheel mounting screw and dowel bolts.	H001-4167600
H192	PACKING: ring shaped; 3-7/16″ OD x 1-3/4″ ID x 3/8″ thk; presses into place in gear cover; Willys part No. 647468.	Engine gear cover to crankshaft seal.	G740-7375028
O-70	PULLEY: 2-step grooved pulley; aluminum cast over steel bushing; 9-7/8″ dia for large step, 4-5/8″ dia for small step, 1-1/2″ thk; dia and depth of bore, 1″ ID, 1-5/16″ d; 2 grooves, 1/2″ wd, 5/8″ d large step, 3/8″ d small step, 36° V; keyway 3/16″ wd x 7/64″ d thru bore; Okeefe & Merritt part/dwg No. 121829.	Crankshaft pulley for driving d-c generator, fan pulley, and governor.	G716-8330347
H206, H207	SCREW, dowel: steel; cone shaped; 3/8″-24, 1-1/4″ lg; press fit into crankshaft drive plate; Willys part No. 632156.	Attaches flywheel to crankshaft.	G503-7371231
H202, H203, H204, H205	SCREW, machine: hex. head; steel; 3/8″-24, NFT, class 2 fit, 3/8″ min lg; 1-5/32″ lg 3/8″ lg thd; 1/4″ thk head; Willys part No. 632157.	Flywheel mounting screws.	G740-7375031
H185, H186, H187, H188, H189, H190	STUD: steel; 1-5/16″ lg x 3/8″ dia; one end, 3/8″-16, NCT, class 2 fit, 1/2″ min lg; other end, 3/8″-24, NFT, class 2 fit, 9/32″ lg; Willys part No. 384958.	Mount timing gear cover to cylinder block.	H001-1312480
H164, H165, H166, H167, H168, H169, H170, H171, H172, H173	WASHER, lock: steel; 21/32″ OD x 3/8″ ID x 3/32″ thk; split ring type; Willys part No. GM 120382.	Mounting washers for bolt and studs attaching gear cover.	H001-7025741
H208, H209, H210, H211, H212, H213	WASHER, lock: steel; .384″ ID x .694″ OD x .035″ thk; shakeproof-type, twisted ext teeth; Willys part No. GM 114606.	For flywheel mounting screws and dowel bolts.	H001-7017680

j. GOVERNOR GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
O-114, O-125	BEARING, ball: single row radial; plain; light duty; 7/16″ bore, 29/32″ OD x 5/16″ wd; fifteen 1/8″ steel balls; oil lubricated; Nice part No. 1607.	Governor control arm bearings.	H012-0710046
O-117	BEARING, ball: single row radial; plain; light duty; 17 mm bore, 40 mm OD, 12 mm wd; 8 steel balls, 9/32″ dia; oil lubricated; New Departure Division of GM Corp part No. 3203.	Governor drive shaft bearing, pulley end.	H012-1303017
O-121	BEARING, ball: single row radial; plain; light duty; 9 mm bore, 26 mm OD, 8 mm wd; seven 3/16″ dia balls; oil lubricated; std fit; New Departure Division of GM Corp part No. 39, type 30.	Governor housing, operating shaft bearing.	H012-1418009
O-120	BEARING, ball: single row axial; light duty; .525″/.523″ ID one side, .502″/.512″ ID other side, 1-17/64″ OD, .4395″ wd; twelve 3/16″ dia balls; oil lubricated; Nice part No. 5313.	Governor yoke thrust bearing.	H012-0710045
H442	BELT, V: comp, cord; 11/32″ thk x 1/2″ wd outside x 1/4″ wd inside x approx outside circum 48″; Gates Rub part No. 61R03-42.	Governor drive belt.	6Z879-30[a]
H419, H420, H421, H422	CLIP, spring: steel wire, 21 ga; 9/32″ wd x 5/16″ h, 5/32″ jaw opening; Okeefe & Merritt part/dwg No. 121597.	Flyweight pin clips.	G716-8331274
O-130, O-166	COUPLING, flexible: rod end type bearing; cad pl steel w/chrome pl steel balls; 1-3/4″ lg x 3/4″ h x 7/16″ thk; mts to stud w/1/4″-28 NF-2 thd; The Heim Co. part No. F-34-14.	Governor link coupling.	G716-8331217
H440	FITTING, tubing: 90° elbow; brass; for 1/4″ tubing; 7/16″-24 female inverted flared tube one end, 1/8″ IPS other end; Imperbrass No. 49-W.	Connection for oil line between engine speed governor and valve spring cover.	H006-0260807
H414	GASKET: treated paper; 5 holes; ring shaped, 3-5/8″ OD x 2-29/32″ ID x 1/64″ thk; four 7/32″ screw holes 90° apart; Okeefe & Merritt part/dwg No. 121598.	Governor bell end to housing gasket.	3H2154-50[a]
O-126	GOVERNOR, engine speed: incl driving pulley; speed limit 1714 to 1775 rpm; 6-43/64″ lg x 7″ wd x 4-1/2″ thk (arm not incl); three 13/32″ x 1-1/32″ slots in mtg fl; Okeefe & Merritt part/dwg No. 121581.	Engine speed regulation.	G780-8328237
O-128	GOVERNOR, velocity: aluminum casting; irregular shape; 4-9/16″ lg x 4-3/8″ wd x 3-1/4″ h; two 13/32″ dia holes 2-3/8″ c to c; King-Seely part No. 235-740C	Engine overspeed limiting.	G716-7327359
H441	LINE, oil: straight flex tube 1/4″ ID x 7/16″ OD x 8″ lg; 7/16″-24 thd male inverted flare swivel fitting one end, 1/8″ IPS male thd other end; Okeefe & Merritt part/dwg No. 122030.	Oil line from engine speed governor to valve spring cover.	G716-8331326
O-129	LINK, governor: steel; 1/2″ OD, 6-7/8″ nom lg c to c, 6-5/8″ min lg c to c, 7-1/8″ max lg c to c; bearings are press connected to carburetor and governor studs; rod end bearings dustproof and have chrome pl steel ball, linkage has over-ride feature to permit use of manual throttle; Okeefe & Merritt part/dwg No. 121203.	Carburetor to governor linkage.	G716-8331218
H433, H434	NUT, hexagon: steel; 5/16″-24, NFT, class 3 fit; 17/64″ thk; 9/16″ across flats.	Governor control arm eyebolt nuts.	H001-4167561
H417, H418	PIN, clevis: steel; 1/4″ OD x 1-1/4″ lg; both ends grooved 1/32″ wd w/.010″ max rad; Okeefe & Merritt part/dwg No. 121593.	Governor flyweight fastening pins.	G716-8331327
H432	PIN, taper: steel; 5/32″ dia x 3/4″ lg; Groov-pin type 1.	Locks control arm to control shaft.	H001-4569142
H412	PIN, taper: steel; 5/32″ dia x 1-1/8″ lg; Groov-pin type 1.	Attaches drive pulley to governor shaft.	H001-4569242

Ref symbol	Name of part and description	Function of part	Stock No.
H409	PLUG, expansion: aluminum 20 ga; for 15/16″ hole; 15/16″ dia, 7/64″ formed thickness; Okeefe & Merritt part/dwg No. 121596.	Governor control shaft bearing hole plug.	H006-0282455
H410, H431	RING, retainer: flat, ext type; steel; round, washer shape; .395″ OD (free dia) x .66″ ID (free ring clearance) x .025″ thk; Waldes part No. Truarc 5100-43.	Governor control shaft bearing retainers.	3H5041.3-20[a]
H416	RING, retainer: flat, int type; steel; 1.756″ OD (free dia) x 1.28″ ID (free ring clearance) x .062″ thk; Waldes part No. Truarc 5000-156.	Governor drive shaft bearing retainer.	3H5041.3-21[a]
H415	RING, retainer: flat, ext type; steel; round, washer shape; .90″ OD (free dia) x .579″ ID (free ring clearance) x .035″ thk; Waldes part No. Truarc 5100-62.	Governor drive shaft retainer ring.	G244-7338576
H411	SCREW, adjustment: 1/4″ dia screw stock, 13/16″ lg, .054″ spherical point; Okeefe & Merritt part/dwg No. 122165.	Holds bumper spring against yoke sleeve at changing speeds.	G716-8331330
H435	SCREW, eye: steel; 5/16″-24, NFT, class 3 fit, 1-3/4″ min lg thd; 2″ lg from ctr of eye, 2-1/4″ o/a; 1-3/4 lg thd; 3/16″ ID min dia of eye; less nuts; milled at eye to 1/4″ thk; Okeefe & Merritt part/dwg No. 121587.	Governor control arm eyebolt.	G716-8331273
H430	SEAL, oil: steel, neoprene; ring shaped; 29/32″ OD x 7/16″ ID x 1/4″ wd; presses into housing; Okeefe & Merritt part/dwg No. 121687.	Control arm oil seal.	3H5225.2-29[a]
H413	SEAL, oil: steel case; round; 1.128″ OD x 5/16″ thk; presses into mtg fl recess; Chi-Rawhide part No. 11120-M-1.	Governor drive shaft oil seal.	H013-0500007
O-118	SHAFT: steel forging; 6-15/16″ lg, 1″ wd max dia, 2-1/8″ across flyweight fingers; ball bearing support at both ends; flyweight yoke perpendicular to shaft; Okeefe & Merritt part/dwg No. 121998.	Governor drive shaft.	G716-7410989
O-119	SLEEVE, governor: steel; 2-1/16″ lg x 1″ OD x 3/8″ ID; ctr hole is running fit over drive shaft; one end is shoulder for thrust bearing, other end fl for flyweight thrust fingers; Okeefe & Merritt part/dwg No. 121609.	Governor thrust member.	3H5247-1.1[a]
O-115	SPRING: helical compression type; .041″ dia music wire; 3/8″ lg x .114″ ID x .200″ OD; 4 total coils; flat ends; held in place by governor bumper screw; Okeefe & Merritt part/dwg No. 122166.	Governor bumper spring.	G716-8331332
O-127	SPRING: helical extension type; .115 music wire; 2-3/4″ lg x 3/4″ OD; 12-1/2 turns; parallel hook term.; Okeefe & Merritt part/dwg No. 121591.	For governor speed regulation.	G716-8331333
H429	STUD: steel; 1-5/16″ lg x 7/16″ OD x 1/8″ thk shoulder, one end 1/4″ dia, other end 3/16″ dia; one end 1/4″-20, NCT, class 2 fit; 5/16″ lg thd; other end 10-32, NFT, class 3 fit, 3/8″ lg thd; Okeefe & Merritt part/dwg No. 121207.	Connects governor to carburetor governor linkage.	G716-8331334
H437, H438	STUD: steel, nickle pl; 3.031″ lg x 3/8″ dia; one end 3/8″-24, NFT, class 2 fit, 5/8″ min lg; other end 3/8″-16, GM std thd, pitch dia .3380″-.3350″, 1/2″ min lg; Okeefe & Merritt part/dwg No. 121343.	Mounting studs for engine governor and carburetor.	G716-8331398
H423, H424, H425, H426	WASHER, flat: 30 ga sheet steel; round, 17/64″ ID x 9/16″ OD x .012″ thk; Okeefe & Merritt part/dwg No. 121602.	Washers for flyweight pin.	G716-8331335
O-122, O-123	WEIGHT, governor: c/o 2 Torrington needle bearings ea assy, flyweight pad, Okeefe & Merritt No. 121589, flyweight, Okeefe & Merritt No. 121594; irregular shape; 2-5/16″ across yoke x 1-1/2″ wd x 1-5/32″ thk; needle bearing pivot mtg; Okeefe & Merritt part/dwg No. 121600.	Centrifugal lever type flyweights.	3H7800-3[a]
H427	YOKE, governor: steel; U-shaped; 1-11/32″ wd x 1-1/2″ h x 1/2″ thk; screws into control shaft; thd 5/16″-24 NF-3 for mtg to control arm; Okeefe & Merritt part/dwg No. 121579.	Transmits motion from governor sleeve to control shaft.	G716-8331336

k. IGNITION AND BATTERY CIRCUIT GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
BT1, BT2	BATTERY, storage: 6 v; 120 amp hr capacity at 20 hr rate; 10-15/16" lg x 7" wd x 8-3/8" h; 3 cells; stored, shipped dry charged; 2 term., one positive, one negative, taper post type; Trojan Battery Co type No. BB221/U.	Produce electromotive energy by electrochemical reaction.	3B275-221[a]
W7	CABLE ASSEMBLY, power: electrical; 1 cond, stranded, #2 AWG (66,330 circular mils); 6-5/8" lg c to c between term.; term. fittings on first end, one term., positive, part/dwg No. 121475; term. fittings on second end, one term. negative, part/dwg No. 121474; Okeefe & Merritt part/dwg No. 121257.	Battery to battery connector.	G780-8328256 3H4582B/M7[a]
W9	CABLE ASSEMBLY, power: electrical; 1 cond, stranded, #2 AWG (66,330 circular mils); 6' lg between term. ctr; term. fittings on first end, one term., negative, part/dwg No. 121474; term. fittings on second end, one term. Thomas & Betts term. lug part No. G-74; Okeefe & Merritt part/dwg No. 122335.	Battery to input terminal cable, negative.	3E7350.1-29.3[a]
W8	CABLE ASSEMBLY, power: electrical; 1 cond, stranded, #2 AWG (66,330 circular mils); 6' lg between term. ctr; term. fittings on first end, one term., positive, part/dwg No. 121475; term. fittings on second end, one term. Thomas & Betts term. lug part No. G-72; Okeefe & Merritt part/dwg No. 122334.	Battery to input terminal cable, positive.	3E7350.1-29.2[a]
W5	CABLE ASSEMBLY, power: electrical; 1 cond, tinned. stranded, #2 AWG (66,330 circular mils); 20-1/4" lg c to c between term.; term. fittings on first end, one term. Thomas & Betts term. lug part No. G-73; term. fittings on second end same as on first end; Okeefe & Merritt part/dwg No. 122388.	Twelve-volt input to ground cable assembly.	G716-8331216
W6	CABLE ASSEMBLY, power: electrical; 1 cond, tinned,. stranded, #2 AWG (66,330 circular mils); 22-1/2" lg between term. ctr; term. fittings on first end, one term. Thomas & Betts term. lug part No. G-73; term. fittings second end, one term. Thomas & Betts term. lug part No. G-72; Okeefe & Merritt part/dwg No. 122389.	Twelve-volt input to start solenoid cable assembly.	G716-8331215
W10	CABLE ASSEMBLY, special purpose: electrical; single cond, stranded, 7 steel wires, .0126-.0134" dia; 18-1/4" lg incl term.; term. fittings on first end ea assy, 1 Titeflex sleeve and spring assy part No. A-25061, 1 Titeflex seal part No. A-37320, 1 Titeflex spring assy part No. A-25063, 1 Titeflex nail part No. AN302-20-2; term. fittings on second end ea assy, 1 Titeflex sleeve and spring assy part No. A-25061, 1 Titeflex seal part No. A-37320, 1 Titeflex spring assy part No. A-25063, 1 Titeflex nail part No. AN302-20-2, 1 Titeflex detachable elbow part No. A-57362; Titeflex part No. C-57361-1515.	Connects ignitor with spark plug No. 1.	G740-7528173
W12, W13, W14	CABLE ASSEMBLY, special purpose: electrical; single cond, stranded, 7 steel wires, .0126-.0134" dia; 14-1/4" lg incl term.; term. fittings on first end ea assy, 1 Titeflex sleeve and spring assy part No. A-25061, 1 Titeflex seal part No. A-37320, 1 Titeflex spring assy part No. A-25063, 1 Titeflex nail part No. AN302-20-2; term. fittings on second end ea assy, 1 Titeflex sleeve and spring assy part No. A-25061, 1 Titeflex seal part No. A-37320, 1 Titeflex spring assy part No. A-25063, 1 Titeflex nail part No. AN302-20-2, 1 Titeflex detachable elbow part No. A-57362; Titeflex part No. C-57361-1115.	Connect ignitor with spark plugs Nos. 2, 3, and 4.	G740-7528174
W15	CABLE ASSEMBLY, power: electrical; 1 cond, stranded, 65,000 circular mils; tinned copper braid; no voltage rating, r-f interference suppression type; 7-1/2" lg between ctr of term.; 1 term. ea end wrapped w/tinned copper plate and two 7/16" dia holes punched; Okeefe & Merritt part/dwg No. 122386.	Engine starter ground strap.	G716-8331211

k. IGNITION AND BATTERY CIRCUIT GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
W11	CABLE ASSEMBLY, power: electrical; 1 cond, stranded, 65,000 circular mils; tinned copper braid; 1 term. ea end wrapped w/tinned copper plate, one 7/16" dia hole punched one end, one 17/32" dia hole punched in other end; Okeefe & Merritt part/dwg No. 122395.	D-c generator ground strap.	G716-8331212
W1, W2, W3, W4	CABLE ASSEMBLY, power: electrical; 1 cond, stranded, 20,400 circular mils; 7-1/4" lg c to c between term.; term. fittings on first end, 1 term., wrapped w/tinned copper plate, 13/32" dia hole punched; term. fittings on second end, 1 term., wrapped w/tinned copper plate, 9/32" dia hole punched; cond c/o 48 strands of .005" dia wire, 17 wires per strand; Okeefe & Merritt part/dwg No. 122390.	Used for unit radio interference suppression.	G716-8331210
O-131	CAM: steel; noncircular shape, with 4 evenly spaced breaker lobes; approx 1-3/4" h x 3/4" dia, 2-3/8" x 13/16" stop plate; mtd to drive shaft by spring clip fastener; Auto-Lite part No. IAU-1100L.	Distributor cam.	G740-7375378
E5	CAP, electrical distributor: melamine plastic; 2-3/4" h x 3" dia; three 3/16" dia mtg holes on a 1-1/4" rad spaced 105°, 105°, 150° apart; incorporates one 5000-ohm resistor in ea of 4 castles in cap; Auto-Lite part No. IAU-1048.	Transfers spark from ignition coil to spark plug leads.	G740-7375377
E25	CAP, electrical distributor: die cast aluminum; 5-7/8" lg x 3-5/8" max wd x 2-5/8" max h; six 3/16" dia mtg holes, 3 ea side, spaced approx 2-5/8" c to c; thd spark plug wire receptacle to give waterproof connection and 1" hex. head inspection plug; Auto-Lite part No. IAU-49.	Distributor cap cover housing.	G740-7375373
C2	CAPACITOR, fixed: paper dielectric; single sect.; 180,000 to 210,000 uuf; nom 6 vdcw; HS metal case; 1-3/32" lg x 11/16" dia; one brass term. 5/32" hole clamped and soldered to lead; grounded; ctr hole to mt capacitor to breaker; Auto-Lite part No. IAU-3076L.	Eliminates arcing across breaker points when open.	G741-7374881
T1	COIL, ignition: 6 v d-c pri oper v; heavy duty type; term. data pri circuit screw type, solderless, LV, located on top; secd term. button type, solderless, h tension v, located on top; metal case; 4-1/2" h x 2-1/16" dia; two 13/64" holes in mtg ears spaced 1-3/4" c to c; Auto-Lite part No. CR-4004.	Supplies high tension electromotive force.	G780-8328239
P4	CONNECTOR, plug: 1 cont, female, round socket type; pol; 90° angle; 35 amp, 500 v dc, 275 v ac rms; round w/90° junction shell, die cast aluminum; accom #12 stranded wire; mtd by thd coupling ring and slot which mates w/receptacle on distributor body, 3/4-20 NEF-2 thd coupling end, 5/8-24 NEF-2 thd conduit end, 1" OD of coupling ring; AMphenol AN3108B-12-5S-4C.	Connects lead from ten terminal receptacle (P1) to ignitor.	G716-8331381
E7	CONTACT SET, distributor: 2 cont, spring leaf type, cur rating 5 amp, v rating 6 v; c/o 1 mtg plate, 1 No. 6-32 x 5/16" lg mtg screw, 1 No. 8-32 x 3/16" mtg screw; Auto-Lite part No. IGP-3028 FS.	Interrupts ignition circuit to cause spark in desired cylinders at suitable moment.	G507-5346774
E6	DISTRIBUTOR, ignition system: for 4 cyl engine; left-hand rotation; automatic spark control; 1 term. No. 3/4"-20 NEF-2 thd shielded post type male connector located on distributor body, 4 single cont connectors No. 5/8-24 NEF-3 thd button type, shielded, located on head of distributor; die cast metal head; die cast metal body; 5-7/8" lg x 5-17/64" wd x 6-15/32" h; one 9/32" dia hole on mtg plate; major components c/o 1 Auto-Lite distributor cap cover part No. IAU-49, 1 Auto-Lite base assy part No. IAU-2064A, 1 Auto-Lite drive shaft part No. IAU-1002L, 1 Auto-Lite cam part No. IAU-1100L, 1 Auto-Lite breaker contact capacitor part No. IAU-3076L, 1 Auto-Lite ignition coil part No. CR-4004, 1 Auto-Lite contact set part No. IGP-3028FS, 1 Auto-Lite distributor rotor assy part No. IAU-1066; pri term. incorporates Aerovox INA-114 series filter; Auto-Lite part No. IBC 4005-UT.	Regulates and transmits electric energy to ignite engine fuel.	G780-8328238

k. IGNITION AND BATTERY CIRCUIT GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
H447	FITTING, pipe: bushing; brass; 1/8″ female pipe x 1/4″ IPS male; Imper brass part No. 110-B.	Connects air line from ignitor to intake manifold tee.	H006-0210010
H444	FITTING, pipe: 90° street elbow; brass; 1/8″ male x 1/8″ female IPS; Imperbrass No. 116-B.	Connection for air line between ignitor and intake manifold.	H006-0265100
H446	FITTING, tubing: inverted male connector; brass; for 3/16″ tubing; 3/8″-24 female tube thd, 1/8″ IPS male thd; nuts and ferrules not incl; Okeefe & Merritt part/dwg No. 122385.	Restricts volume of vacuum to intake manifold.	
H443	FITTING, tubing: 90° elbow; brass; for 1/4″ tubing; 7/16″-24 female inverted flare one end, 1/8″ male IPS other end; Imperbrass No. 49-W.	Connection for air line between ignitor and air cleaner.	H006-0260807
H445	LINE, air: straight flex tube 1/4″ ID x 7/16″ OD x 33″ lg; 3/8″-24 male thd swivel nut for 3/16″ tubing one end, 1/8″ IPS male thd other end; Okeefe & Merritt part/dwg No. 122032.	Ignitor to intake manifold air line.	G716-8331267
E26	ROTOR, distributor: melamine plastic body, and monel metal; 1-1/2″ lg x 1″ wd x 1″ h incl cont spring; electrode, 1/4″ wd x 1/16″ th/; slip fits on to distributor cam, held in place by spring tension; Auto-Lite part No. IAU-1066.	Transfers electrical energy to stationary electrodes.	G740-7348578
O-132	SHAFT: hardened steel; approx 11-1/2″ lg x 1/2″ dia; mtd to rotor cam and stop plate assy w/snap-ring fastener; Auto-Lite part No. IAU-1002L.	Distributor rotor drive shaft.	G740-7375376
E1, E2, E3, E4	SPARK PLUG: cold temp type; 14 mm; approx 3-7/64″ lg, 15/16″ max hex. dia; 2-5/8″ installed h; 3/8″ shell reach; 13/16″ across hex. flats; electrically shielded, 5/8-24 NEF-3 top shielding connection; one screw head type term., recessed; integral 10,000-ohm resistor, fording (waterproof) term. connector; Champion ORD-1.	Discharges spark for igniting engine fuel.	G742-7524258

l. MANIFOLD AND VALVE COVER GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
H275	ADAPTER, breather pipe: steel; cone shaped; 1-1/4″ lg, 1-15/16″ dia; 5/16″ dia hole for mtg screw; one side w/1/8″ pipe thd for fitting; Willys part No. A-6919.	Crankcase ventilator body.	G503-7371286
O-77, O-167	BEARING, sleeve: brass; 3/8″ lg, 7/16″ OD, 5/16″ ID; Willys part No. 636438.	Bearings for heat control shaft.	G503-7371394
O-78	COUNTERWEIGHT: cast iron; oblong; approx 3″ lg x approx 7/8″ wd x 7/16″ thk; one 5/16″ dia mtg hole for shaft; one 7/32″ hole for clamp screw; Willys part No. 637210.	Manifold heat control valve lever.	G503-7371392
H246	FITTING, pipe: tee; brass; for 1/4″ dia pipe; Imperbrass part No. 101-B.	Connects air line and ventilator valve to intake manifold.	H006-0287010
H241	FITTING, pipe: close nipple; brass; for 1/4″ dia pipe; Imperbrass part No. 112-B.	Joins tee to intake manifold.	H006-0210060
H242	FITTING, tubing; 90° elbow; brass; for 5/16″ tubing; 1/8″ pipe thd to 5/16″ inverted flare; nuts or ferrules not incl; Weatherhead part No. 400 X 5.	Breather line to breather valve fitting.	H006-0260850
H278	FITTING, tubing: 90° elbow; brass; for 5/16″ tubing; 1/4″ male pipe to 1/2″-20 female inverted thds; nuts or ferrules not incl; Weatherhead part No. 434 X 5.	Crankcase ventilator body to tube.	H006-0260811
H274	GASKET: cork; w/one hole; washer shaped; 1-15/16″ OD, 1-1/2″ ID, 1/16″ thk; Willys part No. 630299.	Breather adapter to valve cover gasket.	G503-7371272
H233	GASKET SET: asbestos; c/o Willys gasket No. 634814, No. 638640, and No. 634811; Willys part/dwg No. A-7835.	Engine exhaust gasket set.	G503-0194027

l. MANIFOLD AND VALVE COVER GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
H271	GASKET: cork; w/one hole; rectangular; 15-3/16″ lg x 4-3/8″ wd x 1/8″ thk; one side grooved; Willys part No. 630305.	Valve cover gasket.	G503-0194022
H248	KEY, machine: flat; sheet steel; 5/8″ lg x 3/8″ wd x 1/32″ thk; one 7/32″ dia hole at one end; Willys part No. 637211.	Manifold counter weight key.	G503-7371396
H268	LINE, vacuum: preformed, 5/16″ tubing, 7-1/4″ lg, extended; solid wall copper tubing; 5/16″-20 tube thd inverted nut ea end; Okeefe & Merritt part/dwg No. 122094.	Crankcase breather fitting to breather valve line.	
A10	MANIFOLD, exhaust: includes heat valve assembly; cast iron; 16-3/16″ lg x 8″ h x 5-1/2″ thk; three 7/16″ mtg holes 7-3/8″ c to c; Willys part No. A-912.	Exhaust manifold.	G503-7371502
A9	MANIFOLD, intake: cast iron; 11-1/8″ lg x 5-1/2″ wd x 2-1/4″ thk; four 7/16″ dia mtg holes in pairs 2-5/8″ c to c; Willys part No. A-8158.	Fuel and air intake.	G716-7347345
H269	NUT, hexagon: steel; No. 10-24, NCT, class 2 fit; approx 1/8″ thk; 3/8″ across flats; Willys part No. GM 110633.	Lever clamp to shaft nut.	H001-4135661
H251, H252, H253, H254, H255, H256, H257	NUT, self locking, hexagon: brass; 3/8″-24, NFT, class 2 fit; 9/16″ wd across flats, approx 7/16″ o/a h; upper portion has six slots and compressed for locking purposes; Willys part No. 801681.	Manifold mounting nuts.	H001-7025270
H263, H264, H265, H266	SCREW, machine: hex. head; steel; 5/16″-18, NCT, class 2 fit, 1″ lg; length of thd portion is 1″; Willys part No. GM 100122.	Intake to exhaust manifold mounting screws.	H001-5419180
H249	SCREW, machine: roundhead; steel; No. 10-24, NCT, class 2 fit, 3/4″ lg of screw; 3/4″ lg of thd portion; Willys part No. GM 110502.	Lever clamp to shaft screw.	H001-5148281
H277	SCREW, machine: hex. head; steel; 5/16″-18, NCT, class 2 fit, 3-11/16″ o/a lg; 3/4″ min lg; standard screw; no shoulder; cone shaped point; Willys part No. 645093.	Long valve cover and breather mounting screw.	G503-7741420
H273	SCREW, machine: hex. head; steel; 5/16″-18, NCT, class 2 fit, 2-9/16″ o/a lg; 3/4″ min lg thd; standard screw; no shoulder; cone shaped point; Willys part No. 645094.	Short valve cover mounting screw.	G503-7741421
O-76	SHAFT: cold drawn steel; 4-5/8″ lg, 5/16″ dia, mtg w/sleeve bearing; .030″ slot 13/16″ d one end; Willys part No. 637206.	Manifold heat control shaft.	G503-7371391
O-74	SPRING, element: bimetal; coiled ribbon shape; approx 1″ dia, 1/2″ lg extension, 1/4″ thk; mtg by slot in shaft; Willys part No. 647042.	Manifold heat control valve.	G740-7372563
H267	STOP, lever: sheet steel; 1-1/8″ lg x 1″ wd x 9/16″ thk; one 11/32″ dia mtg hole in one end; Willys part No. 639743.	Manifold heat control spring element stop.	G503-7371395
H258	STUD: steel; 1-3/8″ lg, 3/8″ dia; thd, one end, 3/8″-16, NCT, class 2 fit; thd, other end, 3/8″-16, NCT, class 2 fit, 9/16″ min lg; Willys part No. 332515.	Exhaust elbow to exhaust manifold stud.	G503-7734419
H234	STUD: steel; o/a dimen 3/8″ dia x 2-5/16″ lg; thd, one end, 3/8″-16, NCT, class 2 fit, thd other end, 3/8″-24, NFT, class 2 fit, Willys part No. GM 103199.	Exhaust manifold and engine speed governor bracket mounting stud.	H001-1312640
H240	STUD: steel; 2-1/8″ lg, 3/8″ dia; thd, one end, 3/8″-16, NCT, class 2 fit, thd, other end, 3/8″-24, NFT, class 2 fit; Willys part No. A-564.	Exhaust manifold mounting stud.	G740-7372581
H235, H236, H237	STUD: steel; 1-9/16″ lg, 3/8″ dia; thd, one end, 3/8″-16, NCT, class 2 fit, thd, other end, 3/8″-24, NFT, class 2 fit; Willys part No. GM 103196.	Intake manifold mounting studs.	H001-1312520
H238, H239	STUD: steel; 1-3/4″ lg, 3/8″ dia; thd, one end, 3/8″-16, NCT, class 2 fit, 5/8″ min lg; thd, other end, 3/8″-24 NFT, class 2 fit; Willys part No. 632159.	Manifold mounting studs.	H101-0111318

l. MANIFOLD AND VALVE COVER GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
O-73	VALVE, breather: c/o body w/valve assy; steel; hex.; 2-3/16 lg, 13/16″ hex.; mtg, one end 1/4″ male pipe thd, mtg other end 1/4″ female pipe thd; Willys part No. A-6895.	Engine crankcase ventilator valve.	G740-5336400
O-75	VALVE, butterfly: .0747 thk alloy steel; approx square w/round corners, curved surfaces; 2-9/16″ lg x 2-1/8″ wd x 15/16″ thk; welds to shaft; Willys part No. 636439.	Manifold heat control valve.	G503-7371393
H244, H245	WASHER, flat: steel; 13/16″ OD, 13/32″ ID, 3/16″ thk; Willys part No. 344732.	Manifold clamp washer.	G503-7371389
H250	WASHER, flat: steel; .625″ OD, .390″ ID, .064″ thk; Willys part No. GM 103341.	Manifold stud washer.	H001-1530009
H272, H276	WASHER, flat: 1/2″ OD, .313″ ID, .080″ thk; Willys part No. 51875.	Valve cover screw gaskets.	G503-0194032
H259, H260, H261, H262	WASHER, lock: steel; 5/16″ ID, approx 5/8″ OD, approx 1/32″ thk; shakeproof type, twisted internal teeth; Willys part No. GM 115548.	Intake to exhaust manifold washers.	H001-1519010
H270	WASHER, thrust: steel; 1.5″ OD, .313″ ID, .125″ thk; ctr hole mtg; Willys part No. 637209.	Manifold thermostat element thrust washer.	G503-7371398

m. MUFFLER AND EXHAUST SYSTEM GROUP.

Ref symbol	Name of part and description	Function of part	Stock No.
H458	ADAPTER, exhaust pipe: cast iron; elbow shaped; 7-1/4″ lg, 4″ wd flange one end, 2-1/2″ OD; two 13/32″ dia holes 3-1/8″ c to c; two 1/4″-20 tapped holes on pad 2-3/4″ c to c for mtg elec choke, one end 1-1/2″ taper pipe thd; Okeefe & Merritt part/dwg No. 121335.	Connects exhaust pipe to exhaust manifold.	G716-7089993
H456	CLAMP: 1/8″ thk band iron; two bolts; 8-3/16″ lg, 7/8″ wd, 1/8″ thk, 1-11/16″ dia clamping loop; designed to hold 1-1/2″ dia pipe; Okeefe & Merritt part/dwg No. 122316.	Engine muffler mounting clamp.	G716-8331340
H460	FITTING, pipe: 90° elbow; cast iron; 1-1/2″ female ell; Okeefe & Merritt part/dwg No. 122550, item No. 1.	Exhaust pipe to muffler connection.	H006-0264534
H457	GASKET: steelbestos; 3 holes; oval, 3-15/16″ lg x 2-15/32″ wd x 1/16″ thk; Willys part No. 634814.	Seals exhaust pipe adapter to exhaust manifold.	G503-7371390
A38	MUFFLER: 22 ga aluminized steel; cyl, horizontal operating position; 15-9/16″ lg, 4-3/8″ OD; inlet and outlet connections, one end 1-1/2″ std pipe nipple, other end 1-1/4″ std pipe nipple; two 1/8″ dia drain holes located 1/2″ from ea end of muffler; Donaldson model No. M45011.	Muffler for engine exhaust.	G716-8331223
H454	PIPE: wrought iron; 1-1/4″ trade size; one end plain, other end threaded 1-1/4″ std pipe thread; 2-3/16″ lg; two 1/4″ dia holes drilled in line through pipe for locking w/retainer pin, one end threads to extension tube and other end slips into lock coupling and held in place w/retainer pin; Okeefe & Merritt part/dwg No. 121371.	Exhaust extension tube connector pipe.	3H4193-17[a]
H455	SLEEVE, coupling: c/o pin-retainer, Okeefe & Merritt part/dwg No. 121369, coupling, Okeefe & Merritt part/dwg No. 121370, sash chain No. 30, 12 links; wrought iron; cyl, 1-7/8″ OD, 2-1/16″ lg; one end standard 1-1/4″ female pipe thd for mtg to muffler, other end reamed 1-11/16″ dia ID for slip mtg to connector pipe; two 1/4″ dia holes drilled in line through coupling for locking, retainer pin and chain for locking welded to coupling; Okeefe & Merritt part/dwg No. 121368.	Muffler extension tube locking coupling.	3H5247-7[a]
H453	TUBING, exhaust: steel; 124-1/4″ compressed lg, 1-5/8″ ID; flexible tubing; ea end 1-1/4″ IPS straight coupling; compressed lg excluding conections, 10′; threaded ends; Okeefe & Merritt part/dwg No. 121333.	Exhaust extension tube.	G716-7099334 3H6670.15[a]

n. Oil Cleaner and Lubricating System Group.

Ref symbol	Name of part and description	Function of part	Stock No.
H159	CLAMP: sheet steel; 16 gage, 2-5/16″ lg x 3/4″ thk for 1-1/4″ tube; Willys part No. A-5105.	Engine oil fill pipe support.	G503-7368267
H153, H154	CLAMP: SS band, alloy steel adjusting screw; 1″ max dia, 23/32″ dia nominal, 9/16″ wd band; designed for 23/32″ dia hose; Breeze part No. QS100-M6S.	Filler tube breather hose clamps.	H106-0111604
H149	FITTING, pipe: plug; brass; 1/2″ IPS; Imperbrass part No. 109-B.	Plugs tee in oil drain system.	H006-0283571
H143, H147	FITTING, pipe: close nipple; brass; 1/2″ IPS; Imperbrass part No. 112-B.	Connection for oil drain valve.	H006-0269005
H144	FITTING, pipe: tee; brass; 1/2″ IPS; Imperbrass part No. 101-B.	Oil drain tee.	H006-0287005
H146	FITTING, pipe: brass; male end 7/8″-18 thd, female end 1/2″ IPS; 1-5/8″ lg o/a, 1-1/8″ hex. shoulders; Okeefe & Merritt part/dwg No. 121346.	Oil pan drain adapter fitting.	G716-7097295
H298, H310	FITTING, pipe: 90° street elbow; brass; 1/8″ pipe thd; Weatherhead part No. 3400X2.	Oil filter elbow to governor line and to engine block.	H006-0265100
H299	FITTING, pipe: tee; brass; for 1/8″ pipe fittings; size 1/8″ male pipe, x 1/8″ female x 1/8″ female pipe; nuts and ferrules not incl; Imperbrass part No. 127-B.	Connects oil filter to timing gear case oil line and to governor oil line.	H006-0547002
H305	FITTING, tubing: 90° elbow restricted; brass; for 1/4″ tubing; 7/16″-24 female inverted flare one end, 1/8″ IPS male thd other end; nuts and ferrules not incl; restricted to .0595; Imperbrass part/dwg No. 45235.	Connects oil filter line to engine speed governor.	G780-7418398
H300	FITTING, tubing: inverted male connector; brass; for 1/4″ dia tubing; 7/16″-24 female inverted flare one end, 1/8″ IPS male thd other end; nuts and ferrules not incl; Weatherhead part No. 200X4.	Connects oil filter to inlet hose.	H006-0214315
H293	GASKET: treated paper; six holes; irregular shape, 3-15/32″ across at widest point, 2-1/2″ across at narrowest point; 1-1/4″ dia ctr hole, 5 mtg holes placed around ctr hole; Willys part No. 646147.	Seals oil pump to cylinder block.	G740-7372587
H296	GASKET: copper clad fiber; single hole; 7/8″ OD, 5/8″ ID, approx 1/16″ thk; Willys part No. 634813.	Gasket for relief valve retainer.	G503-7371270
H145	GASKET: copper and asbestos; single hole; circular, 1-1/8″ OD, 51/64″ ID, 1/16″ thk; Willys part No. 314338, optional w/640030.	Oil pan drain fitting gasket.	G503-7371284
H301	GASKET: rubber impregnated cork; one hole; 2-1/2″ OD, 2-1/8″ ID, 3/32″ thk; Cuno part No. 28649.	Oil cleaner cover to bowl gasket.	G740-7375059 2Z4868.1140[a]
H121	GASKET SET: cork, treated paper, and copper respectively; c/o one oil pan gasket Willys No. 639980, one oil float support gasket No. 630398, one oil drain gasket No. 314338; part number marked on package; Willys part No. A-1538.	Oil pan gasket set.	G503-0194020
H304	GROMMET: rubber; 27/32″ hole; 13/32″ ID, 1/16″ groove, 5/16″ wd, 1-5/32″ OD; Willys part No. 800802.	Oil cleaner line protection.	G518-7000997
H151	HOSE: rubber; 1/2″ ID, 23/32″ OD, 8-1/2″ lg; Electric Hose & Rubber Co type No. 55-W-65.	Filler breather hose.	H007-0839875
H302	LINE, oil: flexible, synthetic rubber 1/4″ ID x 7/16″ OD, 20″ lg; 7/16″-24 thd, male inverted flare swivel fitting one end, 1/8″ IPS male thd other end; Okeefe & Merritt part/dwg No. 121672.	Engine block to oil filter line.	G740-7372592
H303	LINE, oil: flexible, synthetic rubber 1/4″ ID x 7/16″ OD, 11″ lg; 7/16″-24 thd male inverted flare swivel fitting one end, 1/8″ IPS male thd other end; Okeefe & Merritt part/dwg No. 122029.	Oil filter to governor line.	G716-8331325
H306	LINE, oil: flexible, synthetic rubber 1/4″ ID x 7/16″ OD, 12″ lg; 7/16″-24 thd male inverted flare swivel fitting one end, 1/8″ IPS male thd other end; Okeefe & Merritt Co part/dwg No. 122048.	Oil filter to timing gear case line.	G740-7369882

n. OIL CLEANER AND LUBRICATING SYSTEM GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
O-85	MAINTENANCE PARTS KIT: for Willys oil pump No. 649871; c/o one cover gasket Willys No. 641482, one gear driven Willys No. 641047, one gear pin Willys No. 330964, one shaft and rotor assembly Willys No. 641742; Willys part No. 643362.	Engine oil pump parts kit.	G503-7744329
H152	PIN, cotter: galv steel; 1/8″ dia, 1-1/4″ lg; Willys part No. GM 103386.	Holds oil pan float to support.	H001-0811053
O-83	PLUNGER: steel; cyl; 1/2″ OD; 13/16″ lg; held in place by coil spring; one end beveled, one end hollow for spring entrance; Willys part No. 630518.	Oil pump relief plunger.	G503-7371275
O-82	PUMP, liquid rotary: engine camshaft gear driven, vertical mtg; 4.25 gal per min; 2000 rpm; inlet and outlet openings flush w/machined surface to match w/inlet pipe and outlet opening in engine crankcase, openings approx 1/2″ dia; 6-15/16″ lg, 3-7/8″ thk o/a; cast iron body w/steel shaft; three 13/32″ dia matching holes for mtg; Willys part No. 649871.	Engine lubricating oil pump.	G740-7375072
H297	RETAINER, spring: steel; 7/8″ lg, 7/8″ dia hex. head 3/8″ ID hole drilled 1/2″ d; 5/8″-20 thd mtg; Willys part No. 630390.	Retainer for oil pump relief valve spring.	G503-7371271
H292	SCREW, machine: hex. head; steel; 5/16″-18; NCT; class 2 fit; 1″ min lg; 1″ lg screw, 1″ lg thd; head; 1/2″ wd across flats; 15/64″ thk; part number includes one 5/16″ spring lockwasher; Willys part No. GM 431922.	Attaches oil pump to cylinder block.	H101-0431922
H294, H295	SCREW, machine: hex. head; steel; 5/16″-18; NCT; class 2 fit; 2-1/2″ min lg; 2-1/2″ lg screw; 2-1/2″ lg thd; head; 1/2″ wd across flats 15/64″ thk; part number includes one 5/16″ external lockwasher; Willys part No. 800233.	Attaches oil pump to cylinder block.	G758-8328399
H307, H308, H309	SCREW, machine: hex. and washer head; steel; 5/16″-10; NCT; class 2 fit; 5/8″ min lg; 5/8″ lg max lg; 5/8″ lg thd; Willys part No. 648438.	Hold filter and oil fill tube clamp to bracket on engine.	G740-7369880
H156, H157	SCREW, machine: hex. head; steel; 5/16″-18, NCT, class 2 fit, 3/4″ min lg; 3/4″ lg; 3/4″ lg thd; standard; includes lockwasher as an assy; Willys part No. GM 189691.	Oil float support to cylinder block screws.	H101-0189691
H127, H128, H129, H130, H131, H132, H133, H134, H135, H136, H137, H138, H139, H140, H141, H142	SCREW, machine: hex. head; steel; 5/16″-18; NCT; class 2 fit; 1/2″ min lg; 5/8″ lg; 1/2″ lg thd; standard; includes spring lockwasher as an assy; Willys part No. GM 442695.	Oil pan attaching screw and lockwasher assemblies.	H101-9409097
H123, H124, H125, H126	SCREW, machine: hex. head; steel; 5/16″-18; NCT; class 2 fit; 1/2″ min lg; 1/2″ lg; 1/2″ lg thd; standard; includes spring lockwasher as an assy; Willys part No. GM 193240.	Oil pan attaching screw and lockwasher assemblies.	H101-0193240
O-84	SPRING: helical compression type; steel wire; 1-7/8″ lg, 3/8″ OD, 1/4″ ID; 14 turns; flat ends held in place by relief valve retainer; Willys part No. 645628.	Relief plunger spring.	G740-7372586
O-69	STRAINER, oil, assy: includes float and intake pipe to oil pump; steel; 4-17/32″ dia body, 6-1/4″ lg, 1-13/16″ thk; swivel mtg to support tube; oil intake pipe on one side w/flange to connect to support; Willys part No. 630396.	Maintains oil intake at top of oil level keeping pump sediment-free.	G503-7036578

n. OIL CLEANER AND LUBRICATING SYSTEM GROUP (contd).

Ref symbol	Name of part and description	Function of part	Stock No.
H148	VALVE, gate: brass; 1/2″ female pipe thd each end; sq head stop type; 2″ lg; Roberts Brass Mfg Co part No. 7813.	Engine oil drain valve.	G716-7070496

o. STARTING MOTOR

Ref symbol	Name of part and description	Function of part	Stock No.
E28	ARMATURE, motor: 12 v dc, 200 amp; 11.608″ lg x 2.620″ dia of core; Auto-Lite part No. MDA-2347FT.	Starter armature assembly.	G716-8331453
A37	BAND, brush cover: steel; circular; for 4-1/16″ dia starter housing, 1-3/16″ wd band, 3/8″ flange ea end; fits completely around starter and secured through 3/8″ fl w/std nut and bolt; Auto-Lite part No. MZ-24U.	Starter brush cover band.	G716-8331454
E31, E32	BRUSH, electrical contact: rectangular shape; .508″ lg x .753″ wd x .345″ thk; w/shunt; approx 3-1/8″ lg from brush to soldered connection on field coils; stamped AUTO-LITE MZ-12D; has double cont shunt lead of untinned copper; Auto-Lite part No. MZ-12D.	Commutator brushes for starter.	G716-8331456
E33, E34	BRUSH, electrical contact: rectangular shape; .508″ lg x .753″ wd x .345″ thk; w/shunt; approx 2″ lg from brush to soldered connection on brush holder assy; double cont shunt lead of untinned copper; Auto-Lite part No. MZ-1034CS.	Ground brushes for starter.	G716-8331456
O-133	DRIVE, starting motor: clutch for engaging starter; steel, machined finish; round shape; approx 3-1/2″ lg x approx 2-1/2″ max OD x 9/16″ ID; mts on armature shaft, held in place by retainer and two snap ring stops; Auto-Lite part No. MCS-3075.	Starter clutch gear assembly.	G716-7369885
A36	HOLDER, brush: steel; brush rigging riveted around base plate at 90° angles, four 3/16″ dia mtg holes 2-3/4″ c to c, four compression springs secured to brush holder receptacles at base; two negative brushes grounded to holder assy pl, copper bushing for armature shaft pressed in pl; Auto-Lite part No. MZ-2348.	Commutator end and brush holder assembly.	G716-8331459
H451	PIN: steel; 5/16″ dia x 1-1/16″ lg; cotter pin hole approx 1/8″ from end; Auto-Lite part No. MCH-77A.	Starter clutch engager pivot pin.	G716-8331460
H449	PLATE, stop: for starter clutch; circular shape; approx 9/16″ ID x 7/8″ OD; 3/16″ thk; held in place with snap ring fastener; Auto-Lite part No. MCS-46A.	Starter clutch retainer and pinion stop.	G741-7374940
O-134	RETAINER, bearing: steel; circular shape; approx 3/4″ ID x 3-7/8″ OD x approx 3/32″ thk; mts in grooved end of starter clutch housing w/two std machine screws and washers fitting over edge of bearing on opposite sides; fl 5/8″ lg one side as bearing surface for armature shaft; Auto-Lite part No. MZ-1332A.	Bearing retainer for pinion gear assembly.	G716-8331455
H448	RING, retainer: retainer and pinion stop for starter clutch assy, flywheel end; steel; approx 9/16″ dia; snaps into groove in starter clutch retainer ring and groove on armature shaft; Auto-Lite part No. MCS-47A.	Snap ring fastener.	G716-8331462
L2	SOLENOID, electrical: pull type; steel case; 2 coils; shunt coil, 1.25 to 1.09 ohms resistance, series coil .354 to .309 ohms resistance; 12 v, makes cont 50 amps, breaks cont at 10 amps; 1/2″ max plunger stroke from seal; 5-5/8″ lg x 3-3/8″ wd x 3-9/16″ h; 3 term., screw stud type, one No. 10-32, other 5/16-18 thd, two located centrally on one end of case 1-3/8″ c to c, other located on 1-5/8″ dia circle, spaced 90° from centrally located studs; four 1/4″ x 5/16″ slotted mtg holes, 1-3/4″ c to c, two on ea side of mtg bracket welded to solenoid case; Auto-Lite part No. SSY-4001-T.	Solenoid starting switch.	G716-8331463

Ref symbol	Name of part and description	Function of part	Stock No.
O-135, O-136, O-137, O-138	SPRING: torsion type; approx 1-1/8″ lg x 5/8″ OD, approx 3/8″ ID x 3/16″ wd material; 2-1/2 right-hand turns; straight hook ctr of coil, folded end to ride on top of brush; Auto-Lite part No. MZ-19C.	Starting motor brush springs.	G716-8331464
B1	STARTER, engine: electrical; 12 v dc, approx 50 amp max pull-in at 10 v no load; cw rotation; solenoid actuated overrunning cluth; 11.884″ lg x 4″ dia frame x 6-3/4″ h inclu solenoid; four term., three on starting switch (solenoid), one on motor; stud type, one #10-32, three 5/16-18 thd; 3 studs located on one end of starting switch, one located on side of motor frame; fl mtd, oblong mtg fl 5-3/8″ across ears w/two 13/32″ holes spaced 180° on a 2-1/4″ radius, pilot dia 3.122″; external attachments c/o one starting solenoid part No. SSY-400-T; Auto-Lite part No. MDA-4001-T.	Cranking motor for power unit engine.	G716-8331465
E29	STRAP, connector: brass; 4″ lg x 9/16″ wd x approx 1/16″ thk o/a; two 5/16″ x 3/8″ dia slotted holes, approx 5/32″ from ea end; Auto-Lite part No. MZ-350.	Ground strap jumper connecting starter solenoid and field coil terminal.	G716-8331466
H450	WASHER, thrust: fiber; round; 1.250″ OD x .645″ ID x 3/64″ thk; mts over armature shaft held in place by brush assy pl and armature segments; Auto-Lite part No. MU-54B.	Thrust washer between armature segments and brush assembly.	G502-5346760
H452	YOKE, clutch: steel; "spur" shape; 4-1/2″ max lg x 2-9/16″ wd x 1-1/8″ max thk; secured to engaging solenoid w/3/4″ lg pin and cotter key; pivot attachment on fl of starter housing; "spur" piece rides in rim of pulley type ring; Auto-Lite part No. MZ-2349.	Starter clutch engaging yoke.	G716-8331467

3. Alternating Current Generator

Ref symbol	Name of part and description	Function of part	Stock No.
O-158	BEARING, ball: single row radial (wide type); non-filling slot type w/double seals; 1.1811″ bore x 2.8346″ OD x 1.1875″ wd; seven 17/32″ dia steel balls packed with low temp grease; two dustproof syn rubber impregnated seals for low temp grease; Fafnir part No. W306PP.	Generator rotor bearing.	3H305-216[a]
H543, H544	INSULATOR, bushing: phenolic; screws into thd opening in ac generator housing; Thomas & Betts part No. 72M.	Stator lead bushings.	
E55	ROTOR ASSEMBLY, generator: 1714 rpm, 28 pole; 120 v ac, 400 cyc, single ph, 10,000 w; 120/208 v ac, 400 cyc, three ph, 12,500 w; 12.136″ lg x 11.940″ max dia; has cooling fins integrally cast on ea end of magnet assy; Okeefe & Merritt U. S. Patent No. 2485474; Okeefe & Merritt part/dwg No. 121725.	Produces alternating current when in operation with stator.	
E56	STATOR, generator: 120/208 v ac, 400 cyc, single or three ph; 10 kw, 12.5 kva single ph, 12.5 kw, 15.625 kva three ph; three wd, 84 slots, three 28 coil groups, series wd; six term., T & B solderless lug type, approx lg of leads from exterior surface of stator housing to term. ctr; lead No. 1, 10-1/4″ lg; lead No. 2, 12″ lg; lead No. 3, 14-3/8″ lg; lead No. 4, 11-1/2″ lg; lead No. 5, 11-1/2″ lg; lead No. 6, 12-3/8″ lg; cylindrical shape, 14.496″ OD x 12.010″ ID; Okeefe & Merritt part/dwg No. 100565.	Portion of ac generator in which power is produced.	3H5340A-24[a]

4. Direct Current Generator

Ref symbol	Name of part and description	Function of part	Stock No.
G1	GENERATOR, DC: 28.5 v dc, 2.5 kw, 85% voltage regulation, 4550 rpm, cw rotation; 11-3/16″ lg excluding shaft x 6-5/8″ wd x 12-1/16″ h; Leece-Neville type No. 2554-G12P.	Generates direct current.	3H2441-5[a]
E45	ARMATURE, generator: p/o dc generator, 28.5 v dc, 100 amp; 13-43/64″ lg x 3.768″ max OD; Leece-Neville part No. S-35844.	Generator armature assembly.	3H137LN[a]
O-144	BEARING, ball: single row radial (wide type); non-filling slot type w/double seals; 1.1811″ bore, 2.8346″ OD, 1.1875″ wd, .040″ corner (fillet) radius; seven 17/32″ dia steel balls; "C" low-temp grease; press fit; two dustproof syn rubber impregnated seals for low-temp grease; Fafnir type No. W306PP.	Generator armature bearing, drive end.	3H305-216[a]
O-145	BEARING, ball: single row radial (wide type); double (Plya-Seal) seals; light duty cartridge type; .6693″ bore, 1.5748″ OD, .6875″ wd, .025″ corner (fillet) radius; eight 9/32″ dia steel balls; packed w/low-temp grease; press fit; two dustproof syn rubber impregnated seals for low-temp grease; Fafnir type No. W203PP.	Generator armature bearing, commutator end.	3H305-214[a]
H496	BOLT, machine: hex. head; steel; 3/8″-24, NFT, class 2 fit; 7/8″ lg bolt, 1/2″ lg thr; 3/4″ across flats, 1/4″ thk; 1/2″ dia x 1/4″ lg shoulder; Willys part No. A-1468.	Generator support assembly pivot bolt.	G503-7371188
H500	BOLT, machine: hex. head; steel; 3/8″-24, NFT, class 2 fit; 1-1/4″ lg bolt, 1-1/4″ lg thd; 9/16″ across flats, 9/32″ thk; Willys part No. GM 121615.	Guide to brace bolt.	H001-5421301
E47, E48, E49, E50, E51, E52	BRUSH, electrical contact: rectangular shape, 1″ lg x 1.307″ wd x .245″ thk; w/double shunt; 1-5/8″ lg from brush to ctr of hole in lug; straight end, concave cont face; mtd in brush holder guide, spring tension loaded; carbon; L. N. Co. 29395 stamped on brush side; Leece-Neville part No. 29395.	Dc generator brushes.	3H525LN[a]
C8, C10	CAPACITOR, fixed: paper dielectric; single sect.; 100,000 uuf +50% −10%; 250 v ac, 250 v dc; HS metallic case; two term., slotted hex. head screw type, 1/4″-28 x 5/8″ lg screw, located ea end of can, spaced 2-7/8″ c to c; no internal ground connections; four 11/32″ x 7/32″ slotted mtg holes in integral "L" shape bracket spaced 1-22/32″ c to c; feed thru type w/extremely low impedance over a wide freq range; Sig C type No. CA-491 (modified); Leece-Neville part No. 35681.	For suppression of radio-frequency interference on dc generator.	3D491[a]
C9	CAPACITOR, fixed: paper dielectric; single sect.; 5,000 uuf +20% −10%; 600 v dc rated voltage; HS metallic case; dimen of case incl integral mtg bracket, excluding term.; 1-5/8″ lg x 1/4″ dia x 1-1/16″ wd across bracket; two term., wire lead type, approx 2-5/8″ lg, located ea end of case; no internal gnd connections, mtd by integral bracket w/one 7/32 dia hole spaced 11/16″ c to c from capacitor body; Sprague, catalog No. 79P5.	For radio interference suppression of dc generator.	3DA5-211[a]
O-143	FAN: centrifugal vane type; V belt driven off engine crankshaft; 12 blades; 6-5/8″ OD x 1-5/8″ ID x 3/4″ max thk; belt driven through generator pulley; 4-5/8″ dia x 1/2″ x 36° groove pulley; cw rotation, four outlet slots in generator housing approx 2-5/8″ lg x 1/2″ wd; four .199″ dia holes spaced 90° apart on 1-1/16″ radius from ctr of fan; Leece-Neville part No. 32854.	D-c generator cooling fan.	3H1931-11[a]
H489	GASKET: capacitor cover plate; seven holes incl 6 mtg holes; 3-13/16″ lg x 3-3/16″ wd x .028″ thk; Leece-Neville part No. 35872.	Capacitor cover plate gasket.	2Z4868-1314[a]
H488	GASKET: seven holes incl 6 mtg holes; 6-25/64″ lg x 5-51/64″ wd x .028″ thk; Leece-Neville part No. 35871.	Capacitor cover gasket.	2Z4868-1315[a]

4. Direct Current Generator (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
A44	HOLDER ASSEMBLY, electrical contact brush: 5-9/32″ dia x 3″ thk; six brush holders 45° apart; molded bakelite ring, incl positioning slots, grooves, and markings; Leece-Neville part No. S-29566.	Generator brush rigging assembly.	3H2507.1-26[a]
E101	INSULATOR, cap: cylindrical w/rect mtg base, open one side; plastic; 1-15/16″ h; 2-3/16″ OD x 1-7/8″ ID; 2-1/2″ sq mtg base w/three 13/64″ dia mtg holes, spaced 1-3/4″ apart on 2-1/2″ dia circum; Okeefe & Merritt part/dwg No. 122514.	Prevents personnel from contacting d-c generator output terminals.	
H483	KEY, machine: Woodruff #15; alloy steel; 1/4″ x 1″; Leece-Neville part No. 3109.	Secures drive pulley to armature shaft.	6L995-15[a]
H494, H497	NUT, hexagon: steel; 3/8″-24, NFT, class 2 fit; 21/64″ thk x 9/16″ across flats; Willys part No. GM 120369.	Holds guide support arm to block and guide to brace, and generator arm support assembly.	H001-4167601
H481	NUT, lock: elastic stop nut type; stel, cad pl; 3/4″, 3/4″-16 thd, NFT, class 2 fit; 13/32″ thk; 1-1/16″ across flats; six equally spaced slots for integral locking feature; Leece-Neville part No. 31840.	Secures drive pulley to generator armature shaft.	6L3682-16-17[a]
H484	NUT, round: steel; 1.187-18 thd; 1/4″ thk; 1-9/16″ OD or across flats; 1/8″ x 3/32″ slots spaced at 45° angles around nut; Leece-Neville part No. 18930.	Bearing retainer nut.	6L3439-18-25[a]
O-142	PULLEY: d-c generator drive; V type grooved; steel; 4-1/4″ OD x 1-7/16″ thk; 1.122″ dia bore tapering 1-1/2″ per ft, 1-3/8″ depth of bore; one groove, 1/2″ wd x 5/8″ d x 36° groove; keyway .256″ wd x .136″ d; four No. 10-32 NF-2 tapped holes 5/16″ d spaced 90° apart on a 1-1/16″ radius from ctr of pulley for mtg cooling fan; Leece-Neville part No. 35874.	D-c generator drive pulley.	6Z7682-36[a]
H507, H508	SCREW, machine: hex. head; steel; 3/8″-16, NCT, class 2 fit; 7/8″ lg screw, 5/8″ lg thd; 9/32″ thk x 9/16 across flats; Willys part No. 633949.	Hold d-c generator support assembly arm to block.	H101-0227477
E46	STATOR, generator: 28.5 v dc; 100 amp; 24 wdg; flag type solder lug; cylindrical shape, 4-7/8″ lg, 6″ OD; 11 No. 10-32 NF-2 tapped holes 3/8″ d one end, 8 No. 1/4-20 NC-2 tapped holes 5/8″ d other end; Leece-Neville part No. S-35898.	Generator field ring assembly.	3H5340A-25[a]
O-146, O-147, O-148, O-149, O-150, O-151	SPRING: torsion type; No. 24 (.022) B.W. ga steel; 1-1/8″ c to c of coils, 9/32″ min ID x 11/32″ OD x 9/16″ wd; 4-1/2 right-hand turns; straight hook ctr of coil, one loop other end to ride on top of brush, special mtg bracket receives straight hook in ctr of coil; Leece-Neville part No. 29551.	D-c generator brush springs.	2Z8879-380[a]
E41, E42	TERMINAL, stud: nut and washer connection one end, wire term. other end; brass; approx 1-5/32″ lg x 5/16″ sq stock; mts by thd shank No. 10-32 NF-3 thd, 23/32″ lg; wire term. spot welded to head of stud; Leece-Neville part No. 26221.	D-c generator terminal studs.	3Z12101-37[a]
E43, E44	TERMINAL, stud: nut and washer connection; 1/2″ sq hard brass stock; 1-9/16″ lg to head; head 7/16″ x 1/2″ x .375″ dia; mts by thd shank 1-1/8″ lg, 3/8-24 NF-3 thd after plating; No. 36 (.106) drill hole near end of shank; Leece-Neville part No. 26162.	D-c generator terminal studs.	3Z12101-37.1[a]
H485	WASHER, extruded: steel; round, 1-11/16″ max OD x 1.187″ ID, five 1/8″ x .115″ extrusions equally spaced, one internal tab of same dimensions; Leece-Neville part No. 31097.	D-c generator shaft lockwasher.	6L58449[a]
H486	WASHER, flat: steel; 1-5/8″ OD x 1.187″ ID, No. 22 (.028) B.W. ga; Leece-Neville part No. 28885.	D-c generator guard washer.	6L58039-1[a]
H482	WASHER, flat: 17 ga (.058) CRS; .755″ ID x 1.125″ OD x .058″ thk; Leece-Neville part No. 1882.	Drive pulley to armature shaft.	6L58042C-1[a]

4. Direct Current Generator (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
H499	WASHER, flat: steel; 5/8″ OD x 25/64″ ID x 1/16″ thk; Willys part No. GM 120388.	Washer for guide to brace and adjusting arm assembly.	H001-7045591
H501, H502	WASHER, flat: steel; 1-1/8″ OD x 33/64″ ID x 3/32″ thk; Willys part No. A-1396.	Prevents direct contact of bolt head to insulator.	G716-7371763
H505, H506	WASHER, flat: steel; 1-1/8″ OD x 21/64″ ID x 3/32″ thk; inside dia countersunk; Willys part No. A-1401.	Prevents direct contact of d-c generator support arm to insulator.	G503-7371865
H495, H498	WASHER, lock: steel; 21/32″ OD x 13/32″ ID x 3/32″ thk; split ring type; Willys part No. GM 120382.	For support to block, guide to brace and arm support assembly.	H001-7025741

5. Control Panel and Accessories

Ref symbol	Name of part and description	Function of part	Stock No.
E67, E68, E69, E70, E71, E72, E73, E74	ADAPTER, insulator: black molded plastic; round bushing shaped; 3/4″ lg x 15/16″ OD x 13/32″ ID; plugs into term. block and held in place by 3/8″ term. std; Okeefe & Merritt part/dwg No. 121197.	For mounting 3/8-inch terminal studs to terminal board.	3G100-113[a]
E75, E76, E77	ADAPTER, insulator: black molded plastic; round bushing shaped; 11/16″ lg x 15/16″ OD x 9/32″ ID; plugs into term. block and held in place by 1/4″ term. stud; Okeefe & Merritt part/dwg No. 121196.	For mounting 1/4-inch terminal studs to terminal board.	3H4595G/A2[a]
M6, M7, M8	AMMETER: panel mtd; a-c, 400 cyc per secd, single ph, two-wire; 0 to 100 amp; fl size 5/32″ thk x 3-1/2″ dia, 2-3/4″ body dia, 1-21/32″ body d from mtg surface excl term.; ±2% accuracy at full-scale reading; white scale markings, black background; mtd by three 1/8″ dia mtg holes on 1-9/16″ rad spaced 120 deg apart; 2 term. screw stud type, 1/4″-28 NF-2 thd, approx 11/16″ lg; zero-adjuster accessible from front of case; Westinghouse Electrical Corp part No. MR34B100AFAA.	Indicate load on phases A, B, and C.	3F1100-29[a]
M3	AMMETER: panel mtd; d-c; −15 to 0 to +15 amp range; fl size 2-9/32″ dia x approx 1/8″ thk, 2-5/16″ body dia, 53/64″ body d from mtg surface excl term.; white scale markings and pointer, black background; mtd in panel by strap over term. studs, strap 2-5/16 lg x 1-5/16″ h x 1″ wd; 2 term., screw stud type, 10-32 NF-2 thd, 15/16″ lg; AC Spark Plug Division of GM Corp part No. 1501417 (w/o mtg clamp).	Battery charge rate indicator.	3F1015-55[a]
W18	CABLE ASSEMBLY, power: electrical; 1 cond, tinned, stranded, #2 AWG (66,330 circular mils); 47-1/2″ lg cable; 1 term. Thomas & Betts term. lug part No. G-73, second end w/o term. lug, cable stripped 5/8″ lg for connection to circuit breaker; Okeefe & Merritt part No. 122824.	D-c generator terminal "B" to d-c circuit breaker cable.	
W19	CABLE ASSEMBLY, power: electrical; 1 cond, tinned, stranded, #2 AWG (66,330 circular mils); 48″ lg cable; 1 term. Thomas & Betts term. lug part No. G-73, second end w/o term. lug, cable stripped 5/8″ lg for connection to circuit breaker; Okeefe & Merritt part No. 122822.	D-c generator terminal "E" to d-c circuit breaker cable.	
W20	CABLE ASSEMBLY, power: electrical; 1 cond, tinned, stranded, #2 AWG (66,330 circular mils); 32″ lg cable; term. fitting first end 1 term. Thomas & Betts term. lug part No. G-73, second end w/o term. lug, cable stripped 5/8″ lg for connection to circuit breaker; Okeefe & Merritt part/dwg No. 122823.	Circuit breaker to d-c terminal board cable (positive).	

5. Control Panel and Accessories (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
W21	CABLE ASSEMBLY, power: electrical; 1 cond, tinned, stranded, #2 AWG (66,330 circular mils); 30″ lg cable; term. fitting first end 1 term. Thomas & Betts term. lug part No. G-73, second end w/o term. lug, cable stripped 5/8″ lg for connection to circuit breaker; Okeefe & Merritt part/dwg No. 122825.	Circuit breaker to d-c terminal board cable (negative).	
W17	CABLE ASSEMBLY, power: electrical; 1 cond, stranded, 24 x 13 x .005 = 7800 circular mils, tinned copper braid, no v rating, r-f interference suppression type; 7″ lg between mtg/c of term.; 1 termination ea end, wrapped copper plate, two 3/16″ dia holes punched; Okeefe & Merritt part/dwg No. 122646.	Ground strap, instrument panel to frame.	
C3, C4, C5, C6, C7, C11, C12	CAPACITOR, fixed: paper dielectric; 1 sect.; 100,000 uuf −10% +50%; 100 vdcw; HS metallic case; 1-3/8″ lg x 21/32″ dia; 1 term., screw type, 11/16″ h, located on top; mtg bracket w/hole for 1/4″ screw; Sig C type No. CA-442; Mallory part No. CA-442.	For r-f suppression on d-c and remote control terminals and oil pressure and temperative senders.	3D442[a]
C22, C23, C24, C25	CAPACITOR, fixed: paper dielectric; 1 sect.; 10,000 uuf +0% −30%; 500 vdcw, 500 v ac; HS metallic case; 27/32″ lg x 11/16″ dia; 1 term., screw type, 1/2″ h, located on top; permanent mtg bracket w/hole for 1/4″ screw; Sig C type No. CA-472; Mallory part No. CA-472.	For r-f suppression on a-c output terminals.	3D472[a]
C16, C17, C18, C19, C20, C21	CAPACITOR, fixed: paper dielectric; 1 sect.; 2.70 uf; 400 v ac at 400 cyc; HS metal can; 4-5/8″ h x 3-3/4″ wd x 2-1/4″ thk; 2 term., screw type, 5/8″ h located on top, 2″ c to c; mtd in steel bracket assy w/term. pointed downward; Dubilier part No. TCO-108.	Used with compensator transformer assembly for voltage regulation at various loads.	3DB2E70-1[a]
L3	CHOKE MECHANISM, engine: steel body; 12 v; 3-3/8″ lg mtg fl, 2-1/2″ h x 2-1/8″ wd x 1-1/2″ thk; two 9/32″ mtg holes in fl 2-3/4″ apart c to c; Pierce Gov part No. AC-1099A.	Automatic electric and thermal choke.	
CB2	CIRCUIT BREAKER: air arc quenching; SPST (push-pull type); a-c 115 v, 60 to 400 cyc, 10 amp; d-c 28-30 v, 10 amp; 3000 amp interrupting capacity; thermal trip release; manual auxiliary trip release; time delay type; silver tungsten cont; 2-3/16″ lg x 3/4″ wd x 2″ h excl reset button; steel panel mtd w/two #6-32 self-locking nuts spaced 1.812″ apart c to c; 2 term., screw type, 1/4″ lg, #8-32 screw, located back of case; Mechanical Products, Inc part No. 81-A.	Serves as main load switch and overload trip in engine heater circuit.	3H900-10-31[a]
CB3	CIRCUIT BREAKER: deion arc quenching; 3 PST; a-c 250 v, 400 cyc, ctr pole 100 amp, outside poles 50 amp; 5000 amp interrupting capacity; thermal trip release; time delay type; manual closing; manual reset; molded phenolic case; mp, fp; silver tungsten main cont; 9-3/8″ lg x 4-1/8″ wd x 4-13/16″ h o/a; flush panel mtg w/four holes for mtg screws; 6 term., pressure type for sizes 0 to 14 wire, 5/8″ lg x 5/8″ wd x 29/32″ d, located on front of case; Westinghouse Electric Corp part No. 8E-1134.	Serves as a main load switch and overload trip in a-c circuit.	3H900-50-33[a]
CB1	CIRCUIT BREAKER: deion arc quenching; DPST; d-c 28 v, 100 amp; 500 amp interrupting capacity; thermal trip release; time delay type; manual closing; manual reset; molded phenolic case; mp, fp; silver tungsten main cont; 9-3/8″ lg x 2-3/4″ wd x 4-13/16″ h o/a; flush panel mtg w/four holes for mtg screws; 4 term. pressure type for sizes 0 to 14 wire, 5/8″ lg x 5/8″ wd x 29/32″ d, located on front of case; Westinghouse Electric Corp part No. 8E-1133.	Serves as a main load switch and overload trip in d-c generator circuit.	3H900-100-27[a]

5. Control Panel and Accessories (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
J1	CONNECTOR ASSEMBLY, electrical: 2 connectors in assy; 2 Hubbell, receptacle type No. 9200, 2 cont, flat, female twist lock type; a-c 15 amp, 120 v; plastic case; 2-5/8″ lg excl mtg bkt 1-5/16″ wd x 1-1/8″ d; four 3/16″ dia mtg holes 15/16″ x 3-3/4″ mtg/c; std duplex type; Hubbell type No. 9200.	Control panel trouble light outlet receptacle.	6Z7809-5[a]
J2	CONNECTOR, plug: 10 cont, male, flat 1/4″ x 1/32″ thk; 10 cont, male, flat 1/4″ x 1/32″ thk hook receptacle for soldered connection; pol; straight type; 3-1/2″ lg x 1-5/8″ wd x 1-5/16″ thk excl protruding cont; 10 amp, 110 v; box shape, molded bakelite & steel; molded black bakelite insert; two .187″ dia mtg holes, 3-1/16″ c to c; Jones HB part No. P-410-DB.	Connector plug for electrical leads through unit fire wall.	2Z3030-36[a]
P1	CONNECTOR, receptacle: 10 cont, female; flat; pol; angle type; 90 deg angle; 2-3/8″ lg excl term. x 1-1/8″ wd x 1-7/8″ h; 10 amp, 110 v; box shape, molded bakelite & steel; molded black bakelite insert; 11/16″ dia max cable opening; Jones HB part No. S-410-CCE.	Connector socket for convenience in making electrical contact through fire wall.	2Z3071-29[a]
H561	FITTING, pipe: brass; 1/8″ IPS; Imperbrass part No. 101-B.	Oil transmitter and pressure switch mounting tee.	6Z8635-3.2[a]
H560	FITTING, pipe: close nipple; brass; 1/8″ IPS; Imperbrass part No. 112-B.	Connects oil pressure transmitter and cut-off switch to engine block.	
H559	FITTING, pipe: 45 deg street elbow; brass; 1/8″ IPS male x 1/8″ female pipe; Imperbrass part No. 124-B.	Connects oil pressure transmitter and cut-off switch to engine block.	6Z3671-6[a]
M1	GAGE, pressure: 0 to 60 lbs per sq in.; sheet steel, 2-9/32″ dia fl, 2-5/64″ dia body, 53/64″ lg body w/o term.; flush panel mtg w/clamps; term. posts w/10-32 NF-2 thd on one end and 8-32 NC-2 thd on the other for electrical connections; electrically indicating through transmitter mtd on engine; AC Spark Plug Division of GM Corp part No. 1507766 (wko mtg clamp).	Engine oil pressure indicator.	6Z4251E-1[a]
M2	GAGE, temperature: electrically oper thru transmitter screwed into cyl head; 100 to 220° F; meets —40° F to 132° F requirement; fl size 2-9/32″ dia x approx 1/8″ thk, 2-5/64″ dia body x 53/64″ lg body w/o term. x 1-1/32″ lg term.; AC Spark Plug Division of GM Corp part No. 1512496 (w/o mtg clamp).	Engine water temperature indicator.	6Z4251C-2[a]
H578, H579	GROMMET: rubber; for 1/2″ hole; 1/4″ ID x 1/16″ groove x 3/16″ thk x 5/8″ OD; Kirkhill Rubber Co, Inc Catalog No. G-95.	Protect leads passing through remote control chassis.	6Z4886[a]
H551	KNOB: round; aluminum; shaft 1/4″ dia x 1/2″ d shaft hole, two setscrews; 1-3/16″ dia x 3/4″ thk o/a; Okeefe & Merritt part/dwg No. 122645.	Voltmeter transfer switch control knob.	2Z5822-720[a]
I-1	LIGHT, indicator: supplied w/lens, 5/8″ dia, red, smooth, thd mtd lens holder; accom T-3 lamp, miniature bayonet base; 28 v, .2 amp bulb; 2-1/4″ lg x 3/4″ OD; 1 mtg hole required 5/8″ dia; 3 term. solder lug type located on rear of lampholder; Marco Industries Co part No. VM911-6.	Heater operating indicator light.	2Z5991-294[a]
M4	METER, electrical frequency: panel mtd; a-c 380/420 cyc, single ph, 2 wire; fl size 5/32″ thk x 3-1/2″ dia x 2-11/16″ body dia x 2-1/16″ body d from mtg surface excl term.; white scale markings, black background; three 1/8″ dia mtg holes on 1-9/16″ rad spaced 120 deg apart; 2 term., screw stud type, 1/4″-32 thd 1/2″ lg; Aero Instr model No. 4009.	Indicates the a-c output frequency.	3F3310-7[a]
H552, H553, H554, H555	MOUNT, vibration: cyl shape; 1″ lg x 1″ dia; synthetic rubber; steel washer ea end, tapped 1/4″ —20; 1/4″ mtg/c; Goodrich BF grade No. 9862, type 40.	Vibration insulators for instrument panel.	2Z8403-57[a]

5. Control Panel and Accessories (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
H570, H571, H572, H573	MOUNT, vibration: sq mtg; 1-11/16″ lg x 1/2″ sq body; synthetic rubber cushion, flared tube form, 3/8″ dia, 3/8″ lg; sq steel plate ea end, w/8-32 NC-2 thd; steel clip prevents twisting or turning when installed on base; stud w/8-32 NC-2 thd 9/16″ lg ea end for mtg; Leece-Neville part No. 26155.	Vibration insulators for mounting voltage regulator base.	2Z8405-159[a]
H562, H563, H564, H565, H566, H567, H568, H569	NUT, thumb: hex.; brass and black molded plastic; 3/8″-16; NCT, class 2 fit; 1-1/8″ h; 1″ across flats; ins type thumbnut molded in plastic, brass threaded portion; Okeefe & Merritt part/dwg No. 122348.	Retainer nuts for power take-off leads on terminals.	6L3746-16-16[a]
CR2	RECTIFIER, metallic: selenium; single ph, full-wave; input 15.4 v a-c, single ph, 400 cyc; output 14 v dc, 5.5 amp max cur, full-wave rectification; rectangular shape, o/a dimen of stack excl mtg bkt and term., 4-1/2″ lg plates x 4-1/2″ wd plates x approx 2″ thk stack; four 1/2″ x 3/16″ slotted holes in 2 L-shaped mtg bkt spaced 3″ c to c and 1-1/2″ apart on remote control chassis; 4 term. solder lug type located axially at one end; International Rectifier Corp part No. D1317A.	Changes a-c to pulsating d-c for battery charging purposes.	3H4860-213[a]
CR1	RECTIFIER, metallic: selenium; single ph, half-wave; round shape w/2 projecting term., 1″ dia x 3/4″ h o/a dimen; mtd by #6-32 Bind H screw 17/32″ lg; 2 term. solder lug type located axially at one side and spaced 30 deg apart; Fansteel Metallur part No. FB-53(2H2A1).	Filters a-c current in d-c voltage regulator circuit.	3H4860-212[a]
VR1	REGULATOR, voltage (carbon pile): 28 v dc, 2850 w, 4550 rpm, ±5% regulation max; 5-15/32″ lg x 4″ wd x 3-7/8″ h; clip mtd on Leece-Neville base No. 24554; Leece-Neville type No. 3356-R12.	D-c generator voltage regulator.	3H4965-7[a]
K1	RELAY, armature: one single break cont normally open, one cont double break, one cont single break, dc, 12 v, 60 amp; 3 term. on cont, 2 term. on coil; term on coil not grounded; not a time delay; intermittent duty; HS; 2-13/16″ h; 4 mtg holes in remote chassis spaced 1-3/8″ c to c; C & B Mfg Co part No. 3-3-0-0-H.	Start control relay.	2Z7599A-368[a]
K2, K3	RELAY, armature: single break, dc, 6-8 v, 10 amp; 5 term. on cont, 2 term. on coil; not a time delay; continuous duty; HS; 2-3/4″ h; relay plugs into socket on chassis w/can assy held to same by 4 mtg studs to relieve strain and weight on socket; C & B Mfg Co part No. 2-1-0-1-H.	Battery charging and hold (ignition) relays.	2Z7599A-369[a]
R12	RESISTOR ASSEMBLY: 3 resistors mtd on phenolic board 2-3/8″ lg x 2-3/8″ wd x 1/8″ thk; 2 resistors fixed WW vitreous enameled type, 15 ohms, ±10%; 10 w power dissipation; 1 resistor fixed WW vitreous enameled type, 25 ohms, ±10%, 10 w power dissipation; C & B Mfg Co part No. 25-2-15.	Prevents shorting out of 12-volt system during stopping impulse.	3Z960-63.1[a]
R1	RESISTOR, fixed: WW; 1.8 ohms, ±5%; 49 w power dissipation; not adj; 4″ lg x 1-1/4″ dia; cement coating; 2 term. solder lug type, 5/8″ lg x 5/16″ wd; axially mtd to bracket on remote control chassis w/3/4″ ID centering washers and #10-24 truss head screw; Model Engineering and Mfg Co type RW42G1R8.	Reduces 12-volt battery voltage for 6-volt ignition coil.	3RW7801[a]
R11	RESISTOR, fixed: WW; 25 ohms, ±10%, 25 w power dissipation; not adj; 2″ lg x 9/16″ OD x 5/16″ ID; vitreous enameled coated; 2 term. solder lug type, 19/32″ lg x 9/32″ wd; mtd w/U shaped bracket riveted to remote chassis, bracket 2-3/16″ lg x 1-5/16″ h x 1/2″ wd; Ohmite code DIVBE, stock No. 0200C.	Sets battery charging rate.	3Z5991-13[a]

5. Control Panel and Accessories (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
R9	RESISTOR, fixed: WW; 25 ohms, ±10%; 10 w power dissipation; not adj; 1-3/4″ lg x 5/16″ OD x 3/16″ ID; vitreous enamel coated; 2 term. solder lug type; mtd to phenolic base by solder lug term. approx 3/8″ lg x 3/16″ wd; Model Engineering and Mfg Co. 10 watt Tru-Ohm, type FRL10.	Battery charge relay coil series-dropping resistor.	
R7, R8	RESISTOR, fixed: WW; 15 ohms, ±10%; 10 w power dissipation; not adj; 1-3/4″ lg x 5/16″ OD x 3/16″ ID; vitreous enamel coated; 2 term. solder lug type; mtd to phenolic base by solder lug term. approx 3/8″ lg x 3/16″ wd; Model Engineering and Mfg Co 10 watt Tru-Ohm, type FRL10.	Battery charge relay coil series-dropping resistors.	
R6	RESISTOR, fixed: WW; 18 ±19% ohms, ±5%; 10 w power dissipation; adj, one slide; body dimen excl term. 2″ lg x 19/32″ OD x 3/32″ lg term.; tube wrapped w/mica insulator; 2 term., wire pigtail type, 8 strands #28 bare wire 1-1/2″ lg o/a; mtd to base w/two spring clips inserted in resistor tube openings; Leece-Neville part No. 26548.	Sets range of rheostat.	3Z6001H8-24[a]
R4	RESISTOR, fixed: WW; 360 ohms, ±5%; 1/2 w power dissipation; not adj; 5/8″ lg x 3/16″ dia; molded bakelite housing; 2 term., axial wire type, 1/2″ lg x .032″ dia; term. mtd; IRC type No. BW-1/2.	Stabilizes voltage regulator cricuit.	3Z6036-11[a]
R2, R3	RESISTOR, fixed: WW; 30 ohms, ±10%; 1.2 w; o/a body dimen excl term. 1-59/64″ lg x 9/16″ wd x 27/32″ lg mtg bkt; 1 term.; stud type, 21/32″ lg, No. 8-32 NC-2 thd; AC Spark Plug Division of GM Corp part No. 1517648.	Reduce 12-volt current to 6 volts for panel indicators.	3Z6003-84[a]
E9	RESISTOR, thermal: 6 v dc; 2-3/64″ lg, 15/16″ across flats of hex. portion, bulb is 31/64″ lg x 23/64″ dia; hex. base w/No. 10-32 NF-2 term; mtd by 1/2″ −14 NPT; AC Spark Plug Division of GM Corp part No. 1512400.	Engine water temperature transmitter.	3Z6925-11[a]
R5	RESISTOR, variable: WW; rotating brush type; 1 sect., 5 ohms, ±10%; 4 w nom power rating; straight line taper; 2 term. solder lug type; metal case, inclosed, 1-17/32″ dia x 11/16″ d; shaft data, metal, plain round, 1/4″ dia, 7/16″ lg; mtd by bushing to bkt 3/8″ dia, 32 thd per inch, 1/4″ lg, locating device on 17/32″ rad at 9 o'clock; Leece-Neville part No. S-26396.	Used to adjust the d-c voltage setting.	3Z7005-16[a]
S2	SWITCH, pressure: SPST, normally closed; 2-19/32″ lg x 2-5/32″ dia; 32 v; silver cont; 1 term., stud type No. 10-32 NF-2 thd located one end; one end threaded 1/8″-27 NPT for mtg in fitting; AC Spark Plug Division of GM Corp part No. 1507765.	Engine low oil pressure ignition cut-off switch.	3Z9715-6.1[a]
S8	SWITCH, rotary: 2 sect.; 11 positions and off, max number of switching positions possible, adj stop incl; nonpile-up type, 1 pole, 3 stator cont per sect., 3 throws; 7000 v peak, 20 amp; phosphor bronze w/solid silver cont; 4-1/16″ lg x 3-5/16″ wd x 2-3/4″ h; two 8-32 tapped mtg holes 2-7/8″ c to c; shaft data round type, 13/16″ lg x 1/4″ dia; solder lug term.; Okeefe & Merritt part/dwg No. 122625.	Voltmeter selector switch.	3Z9825-12.31[a]
S3	SWITCH, thermostatic: SPST, normally open; 6-3/4″ lg x 1-3/4″ wd x 1-5/8″ thk; adj oper temp; 10 amp, 12 v dc; 2 term., screw type, located on front; 1/2″ pipe thd for mtg in water outlet elbow; White-Rogers Elec part No. 1190-8.	High temperature ignition cut-off switch.	3Z9695-23.1[a]
S7	SWITCH, toggle: DPDT; 15 amp, 30 v dc; 1-5/16″ lg x 3/4″ wd x 3/4″ d; bat type handle, 11/16″ lg excl lg of bushing; normally open; 6 term., screw type, located on back; single hole mtg type 15/32″ dia bushing, 32 thd per in. 15/32″ lg from mtg surface; Ark-Les part No. 1550T.	Start and run switch for heater.	3Z9849.221[a]

5. Control Panel and Accessories (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
S4	SWITCH, toggle: SPDT; 15 amp, 30 v dc; 1-1/8″ lg x 21/32″ wd x 5/8″ d; bat type handle, 11/16″ lg excl lg of bushing; normally open; 3 term., screw type, located on back; single hole mtg type 15/32″ dia bushing, 32 thd per in., 15/32″ lg from mtg surface; Ark-Les part No. 1540G.	Ignition start-stop switch.	3Z9863-40G[a]
S1	SWITCH, toggle: SPDT; 15 amp 30 v dc; molded plastic body; 1-1/8″ lg x 21/32″ wd x 5/8″ d; bat type handle, 11/16″ lg excl lg of bushing; positive both positions, no ctr position; 3 term., screw type located on back; single hole mtg type 15/32″ dia bushing, 32 thd per in., 15/32″ lg from mtg surface; Ark-Les part No. 1540D.	Selects ignition circuit for remote or manual starting.	3Z9863-40D[a]
TB8	TERMINAL BOARD: molded phenolic; 9 term., 8 in use, double screw type; 4-5/16″ lg x 1-3/32″ wd x 1/2″ h; four 5/32″ dia mtg holes, two ea end of board 7/32″ apart c to c, spaced 3-7/8″ c to c between pairs; Okeefe & Merritt part/dwg No. 122755.	Junction for remote control system leads.	3Z770-8.111[a]
TB9	TERMINAL BOARD: .032″ brass and molded bakelite; 9 wire holes; 7/16″ c to c ea term., 5/8″ wd x 3/32″ thk; 4-5/16″ lg; one .187″ dia mtg hole; Jones HB part No. 9-161AL.	Fanning strip for remote control leads.	3Z770-9.39[a]
TB23, TB24, TB25, TB26, TB27, TB28, TB29, TB30, TB34, TB35, TB36	TERMINAL BOARD: black molded plastic; w/o term., accom one term.; 2-1/8″ lg x 1-3/4″ wd x 1-1/2″ h; one 13/32″ dia ctr hole for stud term. mtg to panel, 1/4″ dia x 3/32″ alining dowel protruding from back corner; Okeefe & Merritt part/dwg No. 121198.	Terminal blocks for a-c, d-c, remote control, and battery input terminals.	3Z770-1.33[a]
E57, E58, E59, E60, E61, E62, E63, E64, E65	TERMINAL, stud: brass; 1-1/2″ lg x 1/4″ dia; mts thru Wye-Delta board secured by 1/4″-28 NF-3 hex. nut ea side; Okeefe & Merritt part/dwg No. 121951.	Wye-Delta terminal studs.	3Z12101-38[a]
E16, E17, E18, E19, E21, E22, E23, E24	TERMINAL, stud: nut and washer connection; brass; 3-1/8″ lg x 3/8″ dia; mts by thd 3/8″-16 NC-2; 7/8″ dia retainer washer as part of stud approx 1/8″ thk, threaded 1-5/16″ one end and 1″ other end; Okeefe & Merritt part/dwg No. 122349.	Terminal studs for a-c output, d-c output, and battery cables.	3Z12101-38.1[a]
E10, E11, E12	TERMINAL, stud: nut and washer connection; brass; 2-7/8″ lg x 1/4″ dia; mts by thd 1/4″-20 NC-2; .078″ dia hole thru one end for retainer wire mtg; Okeefe & Merritt part/dwg No. 121227.	For remote control terminal post.	6L31153[a]
T2	TRANSFORMER, compensator: three ph, 400 cyc, 52 amp pri 2.65 amp secd; 12 term., 6 screw stud type, 6 screw type, located on four molded plastic term. board mtd on compensator supports; incl six 2.7 uf fixed capacitors, 2 wired in parallel per ph; Okeefe & Merritt part/dwg No. 121811.	Tends to stabilize output voltage.	
T4, T5, T6	TRANSFORMER, current: pri wnd, 380 to 420 cyc, 500 v max service v, single ph; cur rating 100 amp pri, 5 amp secd; cur ratio 20 to 1; case type open frame; 3-1/2″ OD x 1-5/8″ ID x 1″ thk; 2 term., solderless lug type, located at ea side of coil; pri circuit 2 term., solderless lug type, located at ea end of cable; held parallel to unit fire wall by 2 molded plastic clamps, mtd to fire wall by L-shaped steel bkt; C & B Mfg Co part No. T-40020.	Output ammeter current transformers.	

5. Control Panel and Accessories (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
T3	TRANSFORMER, power step-down: pri 123 v, 400 cyc, secd, single ph, 14 v approx at no load, 100 v-amp; 4 term., T & B solderless lug type, located axially at sides of coils; open frame (core) type; 4-1/8″ lg x 3-7/16″ wd x 1-1/4″ thk; mtd on v regulator bkt w/4 L-shaped steel bkt w/two 7/32″ x 3/8″ slotted mtg holes spaced 2-13/16″ c to c; .75 ohms pri coil, .0232 ohms secd coil; Okeefe & Merritt part/dwg No. 122431.	Supplies and controls voltage to battery charging rectifier.	2Z9621-469[a]
E8	TRANSMITTER, pressure: 2-11/32″ lg x 2-5/32″ dia; diaphragm oper resistor; 6 v dc; mtd by 1/8″-27 nat. taper pipe thd to fitting; 1 No. 10-32 NF-2 term.; AC Spark Plug Division of GM Corp part No. 1507764.	Engine oil pressure transmitter.	3H2200-23[a]
M5	VOLTMETER: panel mtd; 400 cyc per secd, single ph, 2 wire; 0 to 150; fl size 5/32″ thk x 3-1/2″ dia, 2-3/4″ body dia, 1-21/32″ body d from mtg surface excl term.; white scale markings, black background; mtd by three 1/8″ dia mtg holes on 1-9/16″ rad spaced 120 deg apart; 2 term., screw stud type, 1/4″-28 NF-2 thd, approx 11/16″ lg; zero-adj accessible from front of case; Westinghouse Electric Corp part No. MR34B150AFVV.	Indicates output voltage.	3F8150-152[a]

6. Tools, Frame, and Miscellaneous Equipment

Ref symbol	Name of part and description	Function of part	Stock No.
H598, H599	ABRASIVE, sheet: sandpaper; #0000; 10″ lg x 9″ wd; Minn Mining.	Part of tool equipment for Generator Set, Gasoline Engine PU-107/U.	6Z7500-0000[a]
H614	ADAPTER, fuel drum: 3′ lg x 1-1/4″ wd, hex. adapter 3″ lg; mts to fuel drum x 3/4″ male pipe thd; three breather holes in adapter, Imperial elbow No. 49-F, 5/16″ OD tube size x 1/4″ IPS; Okeefe & Merritt part/dwg No. 122336.	Drum adapter for auxiliary fuel supply.	3H2689.1-29[a]
H613	BOLT, eye: steel, forged; round closed eye, 1-3/16″ ID of eye, 2-1/16″ OD of eye; 1/2″-13, NCT, class 2 fit; 2-9/16″ lg; Okeefe & Merritt part/dwg No. 121400.	Generator lifting eye.	6L5048-16[a]
H603	BURNISHER, contact: silicon carbide, extra fine; 4-3/16″ lg x 3/8″ wd x 1/32″ thk; Snap-On part No. GA-3.	Part of tool equipment for Generator Set, Gasoline Engine PU-107/U.	6Q14565[a]
A87, A88	CLAMP: fire extinguisher mtg; 20 ga sheet steel; 12-11/32″ lg band, 5/8″ wd band, approx 1″ thk clamp; designed to hold 5-1/2″ OD material; lever type clamp welded to end of strap; Okeefe & Merritt part/dwg No. 121825.	Fastener for fire extinguisher.	2Z6820.503[a]
H615	COVER: canvas; water resistant, fireproof; 58-1/2″ lg x 37-3/4″ h x 30-1/4″ wd; secured to unit by four tie ropes, one ea corner; two 6-3/4″ x 6-1/2 cone shaped air vents; Okeefe & Merritt part/dwg No. 122350.	Protective covering for complete generator set.	3H1380.59[a]
A89	CRANK, hand: Z shaped; 17-3/4″ lg o/a, 12-3/4″ lg shaft, 6-1/2″ lg throw, 5″ lg handle, 3/4″ dia rod, 3-1/2″ lg sleeve; crank handle sleeve free turning, crimped in place; Jackson Upset Products Co., part No. 192-B-84.	Engine hand starting crank.	3H1407-1[a]
O-162	EXTINGUISHER, fire: carbon dioxide charge; squeeze-grip operation; five-pound capacity; 16-7/16″ h x 5-1/4″ OD; C-O-Two Fire Equipment Co., part No. 76670, type PS-5.	Fire extinguisher.	6Z3784-3[a]
H586, H587	FASTENER, latch: suitcase type latch; approx 3″ lg x 1-1/4″ wd x 5/8″ thk; three 3/16″ dia mtg holes approx 5/8″ c to c on mtg strap; fastens to hook eye on upper cover; Corbin Cabinet part No. 15641C.	Secures upper rear cover to unit frame.	6Z3640-2[a]

6. Tools, Frame, and Miscellaneous Equipment (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
H597	GAGE, thickness: flat type, six leaves, reading from top down, .025, .015, .020, .018, .022, .030; 1-3/4″ lg closed x 5/8″ wd x 7/32″ thk; ea leaf 1-1/4″ lg x 1/4″ wd; steel leaves; steel handle; A & E Mfg Co., part No. FG-24.	Part of tool equipment for Generator Set, Gasoline Engine PU-107/U.	6Q45706-3[a]
H589	INSULATOR, bushing: phenolic; slips through hole in firewall; secured by 1-1/4″ IPS locknut; Thomas & Betts part No. 73M.	Protects d-c generator leads going through firewall.	3G100-278[a]
H332	LINE, fuel: straight flexible tube 5/16″ ID x 17/32″ OD x 20′ lg; 1/2″-20 thd female inverted flare swivel fitting ea end; Okeefe & Merritt part/dwg No. 122402.	Connects unit to fuel supply auxiliary hose.	3H2689.1-30[a]
H590, H591, H592, H593	MOUNT, vibration: 2-3/4″ dia cushion, 4-5/16″ lg of steel mtg, 1-31/32″ h; syn rubber, 2-3/4″ dia x 1-31/32″ thk; two 5/8″ holes on fl, 3-5/8″ c to c; one 1/2″ hole in ctr; Lord part No. 281PDN-222.	Engine and generator shock mounts.	2Z8405-160[a]
H601	OILER, hand: 8 oz capacity; 7-1/2″ lg flexible spout; 10-1/2″ h x 4″ dia; Huffman Mfg part No. 14.	Part of tool equipment for Generator Set, Gasoline Engine PU-107/U.	6Z7308.6[a]
H594	PLIERS: thin nose side cutter comb; 7-1/2″ lg; Bonney Tool part No. B-26.	Part of tool equipment for Generator Set, Gasoline Engine PU-107/U.	6R4719-7[a]
H616	PULLER, bearing: 7″ lg o/a; screw 7″ lg w/5/8-18 NF-2 thd; 3/4″ sq head for wrench attachment, screw thd 5-5/8″; Okeefe & Merritt part/dwg No. 122428.	Alternator bearing puller.	6R7310-1[a]
H609	SCREWDRIVER: slot drive; 4″ lg blade; 9″ lg o/a; 1/4″ sq shank; 9-32″ wd x 1/32″ thk; plastic handle; Proto Tools part No. 9804.	Part of tool equipment for Generator Set, Gasoline Engine PU-107/U.	6R15610[a]
H608	SOCKET, wrench: 12 point, 1/2″ sq drive, spark plug type; 13/16″ opening; 3-1/4″ lg x 1-1/32″ OD; 3/8″ dia hole for pin handle; Proto Tools part No. 5347.	Part of tool equipment for Generator Set, Gasoline Engine PU-107/U.	6R57612[a]
O-160	SPRING: torsion type; .095″ dia music wire; 3-1/8″ working lg x 3/4″ wd x 11/16″ dia; 4 complete turns; hook type ends, 3/16″ lg ea end; Okeefe & Merritt part/dwg No. 122302.	Radiator access door spring, left hand.	2Z8879-379[a]
O-161	SPRING: torsion type; .095″ dia music wire; 3-1/8″ working lg x 3/4″ wd x 11/16″ dia; 4 complete turns; hook type ends, 3/16″ lg ea end; Okeefe & Merritt part/dwg No. 122301.	Radiator access door spring, right hand.	2Z8879-381[a]
H607	WRENCH: adj crescent; 0 to 15/16″ range; 8″ lg, 2″ wd jaw end; 15/16″ wd, handle end; McKaig-Hatch Inc Cat. No. 208.	Part of tool equipment for Generator Set, Gasoline Engine PU-107/U.	6R55018.1[a]

7. Winterization and Heater Group

Ref symbol	Name of part and description	Function of part	Stock No.
A57	BURNER: engine heater; SS; bowl shape; 4″ h x 5″ OD; burner and heater equipped with four locking levers spaced 90° apart; Perfection Stove Co part No. C3635.	Engine heater burner.	6Z1652-1[a]
W16	CABLE ASSEMBLY, special purpose: electrical; single cond, stranded, #14 AWG c/o 19 strands of #27 AWG (3828.5 cir mils); 11″ lg o/a; term. fittings on 1st end, one term., ORD part No. 7762622; term. fittings on 2d end, one term., ORD part No. 506208; Perfection Stove Co part/dwg No. B3431-G1.	Fuel pump lead conector.	3E4002[a]
H519, H524, H527, H528	CLAMP: SS band, alloy steel adj screw mechanism; 1-1/4″ max dia, 1″ dia nominal, 9/16″ wd band; clamp 1″ OD rubber coolant hose; Breeze part No. QS100-M10S.	Winterization coolant hose clamps.	

7. Winterization and Heater Group (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
E53	CLAMP, electrical: die cast aluminum; fastening device; one saddle clamp w/two screws and two spring lockwashers; screws onto connector, 7/8″-20 NEF thread, 1/2″ max lg engagement; designed to hold material 5/8″ max dia; incl rubber washer and brass nickle pl washers; Amphenol part No. AN3057-8-6-8C.	Holds leads to connector and prevents twisting or pulling of soldered connections.	2Z2636-1[a]
E54	CLAMP, electrical: die cast aluminum; one saddle clamp w/two screws and two spring lockwashers; screws onto connector, 5/8″-24 NEF thd, 3/8″ max lg of engagement; designed to hold material 5/16″ max dia; incl rubber washer and brass nickle pl washer; Amphenol part No. AN3057-4-6-8C.	Holds leads to connector and prevents twisting or pulling of soldered connections.	2Z2642.325[a]
H535	COCK: removable screw plug; brass; Tee handle; 1/2″ male pipe thd; Okeefe & Merritt part/dwg No. 122332.	Water drain cock for heater.	6Z2118-27[a]
H513	COCK: screw type valve; brass; T type handle; 1/8″ male pipe size thd; bib flush with T handle; 1-1/8″ lg o/a; Weatherhead part No. 130.	Heater fuel drain cock.	3H1912A/C35[a]
P3	CONNECTOR, plug: 5 cont, female, round socket type; front shell w/pol slot for engagement w/pol key in receptacle; 90° angle; 20 amp, 200 v dc, 150 v ac rms; round w/90° junction shell, die cast aluminum, split shell type; molded thermosetting plastic insert; accom five #16 AWG wires; mtd by thd coupling ring and slot which mates with pol key in box receptacle, 1-1/4″ OD coupling ring, 1″-20 NEF thd size of coupling ring, 7/8″-20 NEF thd other end for mtg cable clamp; Amphenol part No. AN3108B-16S-8S-6-8C.	Connects control leads to box receptacle on heater assembly.	2Z3066-99[a]
P2	CONNECTOR, plug: two male cont, round pin type; cyl body; accom two #16 AWG stranded wires; mtd by thd coupling ring and slot which mates w/pol key in receptacle, has 5/8″-24 thd one end for mtg cable clamp; Amphenol part No. AN3106-12S-3P-6-8C.	Male connector for thermostat leads.	2Z7112.16[a]
J3	CONNECTOR, receptacle: 5 cont, male, round pin type; contains internal pol key for mating w/pol slot in plug front shell; straight type; 20 amp, 200 v dc, 150 v ac rms; cylindrical shape w/sq mtg fl, die cast aluminum, solid shell type; molded thermosetting plastic insert; accom five #16 AWG stranded wires; four mtg holes, .120″ dia, mtg holes spaced 31/32″ c to c; Amphenol part No. AN3102A-16S-8P.	Receptacle for heater control leads.	2Z8799-244[a]
A59	DUCT ASSEMBLY: SS; multiple duct, three holes; 1-3/4″ max OD; Y end and mtg elbow solid wall SS, 9-13/16″ lg portion flexible, SS tubing; Y end plain, grooved to fit against intake manifold, other end c/o elbow w/spot welded clamp for mtg to heat exchanger pan; mtg clamps spot welded to tube; Okeefe & Merritt part/dwg No. 121978.	Conducts heated air from exchanger pan to intake manifold.	
A60	DUCT ASSEMBLY: SS; single duct, two holes; 2-11/16″ OD x 2-1/2″ ID max; SS 90° elbow, 1-3/4″ OD w/connector clamp one end, SS 60° elbow, 1-3/4″ OD w/connector clamp other end; 15-13/16″ straight length; flexible tubing 1-1/2″ ID and 2-1/2″ ID, 18 BW ga elbows; clamp incl w/ea elbow; Okeefe & Merritt part/dwg No. 122229.	Conducts heated air from engine heater to exchanger pan.	
E20	ELECTRODE: hollow w/core; resistance core w/igniter resistor element; steel body w/ceramic ins post; 4″ lg x 3/4″ max dia; draws from 10 to 12 amp from a good battery; rated 6 v dc; indexing dot on tube for locating igniter into groove in heater housing, held in housing by retaining nut; Perfection Stove Co part No. B1613-G2 incl gasket.	Ignites fuel mixture in burner bowl.	6Z3710[a]
H522, H531	FITTING, pipe: 90° street elbow; brass; 1/2″ male IPS x 1/2″ female pipe; Imperbrass part No. 124-B.	Connect coolant lines from heater to block and water pump.	6Z3671-7[a]
H518, H529, H533	FITTING, pipe: 45° elbow; brass; 5/8″ ID hose size x 1/2″ IPS male; Dumont Aircraft Fitting Co type No. AN844-10.	Coolant hose connectors.	6Z3671-5[a]

7. Winterization and Heater Group (cont)

Ref symbol	Name of part and description	Function of part	Stock No.
H536	FITTING, tubing: 90° elbow; brass; for 1/4″ tubing; 7/16″-24 female thd for inverted flare tube one end and 1/8″ male other end; Imperbrass part No. 49-W.	Connection for fuel line to engine heater.	6Z3888A-22[a]
H540	FITTING, tubing: inverted male connector; brass; for 1/4″ tubing; 7/16″-24 female inverted flare one end and 1/8″ IPS male other end; Weatherhead part No. 200 X 4.	Connection for fuel filter line to electric fuel pump.	6Z8635-3.1[a]
H539	FITTING, tubing: 45° elbow; brass; for 1/4″ dia tubing; 7/16″-24 thd for inverted flare tube one end, 1/8″ IPS male other end; nuts and ferrules not incl; Imperbrass par No. 94-W.	Connects fuel control valve to heater fuel supply line.	6Z3888A-23[a]
H514	GASKET: copper clad asbestos; one hole; round, 2″ OD x 1-1/2″ ID x 3/32″ thk; Perfection Stove Co part No. A 4675.	Mounting gasket for resistor to burner.	2Z4868.1316[a]
H511	GROMMET: rubber; fits 13/16″ dia hole; 9/16″ ID, 1/16″ groove width, 5/16″ thk, 1-1/16 OD; Perfection Stove Co part No. A3692.	Protects leads from terminal block.	6Z4861.1[a]
O-155	HEATER, air: 14″ h, 11-1/4″ wd incl motor, 5-7/16″ thk incl mtg fl; equipped w/12 v blower motor; SS housing w/air blower, resistor, and igniter; mts by four 3/8″-16 mtg weld nuts on 3-3/4″, 2-1/8″, and 2-7/8″ ctr; Perfection Stove Co model No. 590-12-1.	Warms engine for ease in cold weather starting.	6Z5056-16[a]
H520	HOSE: 5/8″ ID x 1″ OD x 9-1/2″ lg; B.F. Goodrich Co type MIL-H-6000.	Conducts coolant from engine heater to cylinder block.	
H521	HOSE: 5/8″ ID x 1″ OD x 21″ lg; B.F. Goodrich Co type MIL-H-6000.	Conducts coolant from water pump to engine heater.	
H537	HOSE: heater drain; syn rubber and impr cotton braid; 4″ lg x 1/2″ ID x 23/32″ OD; slips over heater drain valve extension tube; Electric Hose & Rubber part No. 55-W-65.	Heater drain valve extension hose.	
H523	HOUSING: thermostat; brass casting; approx sq body w/nipple end; 3-7/8″ lg x 1-1/8″ wd x 1-13/32″ h; 1/2″ IPS thd mtg into brass pipe elbow; 13/16″ dia opening for thermal element in top; Okeefe & Merritt part/dwg No. 121892.	Thermal element housing assembly.	3H2549.22[a]
O-154	IMPELLER, centrifugal: SS; paddle-wheel shape; 2-1/2 OD x 15/16″ thk; 1/4″ single hole axially mtd to blower motor shaft, held by setscrew; Perfection Stove Co part No. A3106.	Supplies combustion air to engine heater.	3H2565-25[a]
H541	LINE, fuel: straight flexible tube 1/4″ ID x 7/16″ OD x 15-1/2″ lg; syn rubber inner tube, impr cotton braid and syn rubber outer cover; 7/16″-24 thd male inverted flare swivel fitting both ends; Okeefe & Merritt part/dwg No. 122406.	Connects fuel control valve with engine heater.	3H2689-23[a]
H538	LINE, fuel: flexible wall 1/4″ ID x 7/16″ OD hose 4-11/16″ lg incl fittings; 1/8″ IPS rigid male fitting one end, 1/8″ IPS flared male swivel other end; special copper wire wdg for gnd purposes; American Coupling Corp part No. 1103.	Connects electric fuel pump to fuel control valve.	3H2689-22[a]
B2	MOTOR, DC: series-wound type; 12 v dc, 1.1 amp; single take-off, 5200 rpm, cw rotation; closed, dust-proof frame; motor dimen data, 3-31/32″ lg excluding shaft, 2-31/32″ wd, 1/4″ dia shaft, shaft extends 51/64″ from frame; two term., one wire pigtail type, one gnd strap type; two mtg studs, 8-32 NC-2, 7/16″ lg. spaced on vert ctr line 1-5/32″ rad from shaft ctr; Perfection Stove Co part No. C2355-G5.	Engine heater exhaust blower motor and left half scroll.	3H3100-94[a]
H532	NIPPLE, pipe: close nipple; brass; 1/2″ male IPS; Imperbrass part No. 112-B.	Connects tee to engine heater.	6Z3888-144[a]
H516	NUT, packing: brass; 1″-20, NEF, class 2 fit; 3/8″ thk; 1-1/8″ across flats; Perfection Stove Co part No. A1620.	Holds igniter in burner body.	6L2601-20-18[a]
H526	NUT, knurled: brass; 1″-20, NEF, class 2 fit; 7/16″ thk x 1-1/4″ dia; knurled gripping surface; Perfection Stove Co part No. A3541.	Retains thermal element in thermostat housing.	6L3401-20-20K[a]

Ref symbol	Name of part and description	Function of part	Stock No.
L5	PUMP, liquid plunger: integral electrical driven; vertical mtd; 1/8″ female pipe inlet and outlet fittings; 5-1/8″ lg x 2-1/8″ dia; steel case; two 9/32″ x 11/32″ mtg slots 2-1/2″ c to c in fl welded to body; rated 12 v dc, .65 amp max current, incl shielded electrical lead and connector w/feedthru capacitor; Eclipse Mach model No. 475952.	Engine heater fuel supply pump.	3H4606-5[a]
R10	RESISTOR, fixed: WW; .545 ohms ±10%; 66 w power dissipation; non adj; dimen of body excluding term. 2-5/8″ lg incl bracket, 2-1/2″ wd incl bracket, 1-9/32″ OD resistor; 2 term., stud type, 1/4″-24 x 1/2″ lg; mtd in heater, specifically designed for 1-1/2″ dia hole in heater; Perfection Stove Co. part No. B3661-G1.	Reduces 12 v to 6 v for igniter.	3Z5985D4[a]
H509	RETAINER, spring: brass; cup shape; Perfection Stove Co part No. A14761.	Retains quartz rod and spring.	
O-152	SPRING: helical compression; 1/2″ lg x 1/2″ dia; 5 turns; Perfection Stove Co part No. A14437.	Holds retaining cap against quartz rod.	
O-153	SPRING: helical compression; .040″ dia wire; 3/4″ lg x 1/4″ dia; 7 turns; Perfection Stove Co part No. A14436.	Holds microswitch adjusting screw.	
S9	SWITCH, sensitive: SPDT; 12 v dc, 25 amp; molded plastic body; 1-15/16″ lg x 11/16″ wd x 13/16″ h; plunger actuated; two cont normally open, two cont normally closed, 5 term., screw type; one .152 x .140 elongated mtg hole, one .140 mtg hole spaced 1″ c to c; Micro Switch Division part No. BZ3YST.	Controls electrical supply to fuel pump, control valve, indicator light, and blower motor	
S5	SWITCH, thermostatic: SPDT; molded plastic case; 7-3/8″ lg x 2-1/2″ max wd x 7/8″ thk excluding hardware; 12 v dc, 25 amp, 5 term., screw type, located on one end; thermostat element tube slips into heater cover, held in place by compression nut; Perfection Stove Co part No. B3673-G1.	Establishes and controls electrical supply to fuel pump, control valve, indicator light, and blower motor.	3Z9695-42[a]
H534	TEE, pipe: brass; 1/2″ x 1/2″ x 1/2″ female IPS; Imperbrass part No. 101-B.	Connection for heater water inlet.	6Z3858T-3[a]
TB10	TERMINAL BOARD: molded thermosetting plastic; incl four term., double screw type; 2-1/2″ lg x 1-1/8″ wd x 1/2″ thk; four 3/16″ dia mtg holes on 2-3/16″ x 7/16″ mtg ctrs; Perfection Stove Co part No. A2359.	Junction for electrical heater leads.	3Z770-4.154[a]
TB11	TERMINAL BOARD: molded plastic; 2 term., comb screw and solder lug type; 2-1/4″ lg x 1-1/16″ wd x 1/2″ thk; four 7/32″ dia mtg holes, two on ea end, spaced 1-11/16″ c to c and 9/32″ apart; Howard B. Jones Div, Cinch Mfg Corp part No. 2-142YA.	Junction for heater fuel control leads.	3Z770-2.128[a]
H510	THERMAL ELEMENT: quartz rod; 5-7/16″ lg x 3/32″ dia; slips into metal tube, held in place by spring retainer cap; Perfection Stove Co part No. A14439.	Actuates spring which releases microswitch plunger.	3H5566-3[a]
S6	THERMAL ELEMENT: c/o thermal element, female connector; thermal element brass bowl and bimetal element, female connector die cast aluminum, phenolic insert; 200 v dc, 35 amp; closes at +100° F, opens at +150° F; assy held into thermostat housing by brass coupling nut; one end of connector has 3/4″-20 NEF thd; Perfection Stove Co part No. A3529-G1.	Energizes heater fuel control valve coil.	3H5566-2[a]
L4	VALVE, solenoid: steel; 1/8″ female pipe thd inlet and outlet; 12 v rated oper requirement; 1-3/8″ between attachment fittings; South Wind Div, Stewart-Warner Corp part No. 484075-12 v.	Electrically restricts or emits proper fuel quantity to burner.	3H6682-47[a]
H515	WASHER, flat: copper, asbestos; 3/4″ OD x 9/16″ ID x 1/16″ thk; Perfection Stove Co part No. A1624.	Igniter mounting washer.	6L50316-5[a]
H525	WASHER, flat: fiber; round, 29/32″ OD x 11/16″ ID x 1/32″ thk; Perfection Stove Co part No. A3540.	Thermal element washer.	6L50531-1[a]
H512	WICK: asbestos w/wire core; 1-3/4″ h x 2″ OD; Perfection Stove Co part No. A2312.	Engine heater burner wick.	6Z9446-4[a]

APPENDIX III

TABLE OF STANDARD NUTS, BOLTS, SCREWS, AND WASHERS

1. Engine

Quantity	Item	Size	Length	Thread	Where used
	CAMSHAFT				
2	Bolt: Hex. head.	3/8″	3/4″	NC 16	Secures thrust plate to block.
2	Washer: lock.	3/8″			Used with above.
1	Bolt: hex. head.	7/16″	1-1/8″	NC 14	Retains gear on camshaft.
1	Washer: lock.	7/16″			Used with above.
	CRANKSHAFT AND CONNECTING ROD				
6	Screw: hex. head.	1/2″	2-3/8″	NC 13	Secures bearing caps to crankcase.
6	Washer: lock.	1/2″			Used with above.
8	Nut: hex.	3/8″		NF 24	Secures connecting rod cap to connecting rod.
8	Nut: lock.	3/8″		NF 24	Used with above.
4	Bolt: hex. head.	3/8″	1-1/8″	NF 24	Locks piston pin.
4	Washer: lock.	3/8″			Used with above.
	CYLINDER HEAD				
3	Bolt: hex. head.	3/8″	1-1/8″	NC 16	Secures coolant outlet elbow to cylinder head.
3	Washer: lock.	3/8″			Used with above.
15	Nut: hex.	7/16″		NF 20	Secures cylinder head to block.
	FLYWHEEL HOUSING, FLYWHEEL, AND REAR PLATE				
4	Bolt: hex. head.	3/8″	1-1/8″	NF 24	Secures flywheel to crankshaft.
6	Nut: hex.	3/8″		NF 24	Same as above.
6	Washer: lock.	3/8″			Used with above.
1	Bolt: hex. head.	1/4″	1/2″	NC 20	Secures timing hole cover to rear plate.
1	Washer: lock.	1/4″			Used with above.
4	Bolt: hex. head.	3/8″	1″	NC 16	Secures flywheel housing and rear plate to engine.
2	Bolt: hex. head.	3/8″	1-1/2″	NC 16	Same as above.
8	Nut: hex.	3/8″		NC 16	Same as above.
8	Washer: lock.	3/8″			Used with above.
8	Washer: flat.	3/8″			Same as above.
12	Screw: RH machine.	No. 10	1/2″	NC 24	Secures screens to flywheel housing.
12	Washer: lock.	No. 10			Used with above.
12	Washer: flat.	No. 10			Same as above.
	GEAR COVER AND FRONT PLATE				
3	Bolt: hex. head.	3/8″	3/4″	NF 24	Secures gear cover to engine plate.
1	Bolt: hex. head.	3/8″	1″	NF 24	Same as above.
4	Nut: hex.	3/8″		NF 24	Same as above.
4	Washer: lock.	3/8″			Used with above.
3	Bolt: hex. head.	3/8″	3/4″	NC 16	Secures engine plate to block.
3	Washer: lock.	3/8″			Used with above.
6	Nut: hex.	3/8″		NF 24	Secures engine plate and gear cover to block.
6	Washer: lock.	3/8″			Used with above.
	MANIFOLDS				
7	Nut: hug-lock.	3/8″		NF 24	Secures intake and exhaust manifold to block.

1. Engine (contd)

Quantity	Item	Size	Length	Thread	Where used
3	Washer: flat.	3/8"			Used with above.
4	Bolt: hex. head.	5/16"	1"	NC 18	Secures exhaust manifold to intake manifold.
4	Washer: lock.	5/16"			Used with above.
1	Bolt: hex. head.	3/8"	1-1/2"	NF 24	Secures exhaust pipe adapter to exhaust manifold.
2	Nut: hex.	3/8"		NF 24	Same as above.
1	Screw: RH machine.	No. 10	3/4"	NC 24	Secures heat control lever to shaft.
1	Nut: hex.	No. 10		NC 24	Same as above.
	OIL PAN AND FLOAT				
2	Bolt: hex. head.	5/16"	3/4"	NC 18	Secures float support to cylinder block.
2	Washer: lock.	5/16"			Used with above.
16	Bolt: hex. head.	5/16"	5/8"	NC 18	Secures oil pan to block.
4	Bolt: hex. head.	5/16"	1/2"	NC 18	Same as above.
20	Washer: lock.	5/16"			Used with above.
	OIL PUMP				
1	Bolt: hex. head.	5/16"	1"	NC 18	Secures oil pump to cylinder block.
2	Bolt: hex. head.	5/16"	2-1/2"	NC 18	Same as above.
3	Washer: lock.	5/16"			Used with above.
3	Bolt: hex. head.	1/4"	5/8"	NC 20	Secures cover to pump body.
3	Washer: lock.	1/4"			Used with above.
	WATER PUMP				
1	Bolt: hex. head.	5/16"	2-1/2"	NC 18	Secures water pump to block.
3	Bolt: hex. head.	5/16"	1"	NC 18	Same as above.
4	Washer: lock.	5/16"			Used with above.

2. Subassemblies

Quantity	Item	Size	Length	Thread	Where used
	AIR CLEANER				
4	Bolt: hex. head.	1/4"	5/8"	NC 20	Secures air cleaner to frame.
4	Nut: hex.	1/4"		NC 20	Same as above.
2	Washer: flat.	1/4"			Used with above.
4	Washer: lock.	1/4"			Same as above.
1	Screw: RH machine.	1/4"	1-1/4"	NC 20	Secures air cleaner damper.
1	Washer: lock.	1/4"			Used with above.
	CARBURETOR				
2	Nut: hex.	3/8"		NF 24	Mounts carburetor.
2	Washer: lock.	3/8"			Used with above.
2	Bolt: hex. head.	1/4"	1/2"	NC 20	Mounts automatic choke.
2	Washer: lock.	1/4"			Used with above.
1	Screw: RH machine.	No. 8	3/8"	NC 32	Secures manual throttle cable retainer.
1	Screw: RH machine.	No. 10	3/8"	NF 32	Secures manual throttle arm to carburetor.
1	Nut: hex.	No. 10		NF 32	Same as above.
1	Washer: lock.	No. 10			Used with above.
1	Screw: RH machine.	No. 10	1/2"	NF 32	Secures manual throttle clip.
1	Washer: flat.	No. 10			Used with above.
1	Washer: lock.	No. 10			Same as above.
1	Screw: RH machine.	No. 10	5/8"	NF 32	Secures manual choke arm to carburetor.
1	Nut: hex.	No. 10		NF 32	Secures carburetor-to-governor-linkage to carburetor.
1	Washer: lock.	No. 10			Used with above.
2	Screw: RH machine.	No. 3	1/4"	NC 48	Secures carburetor throttle plate.
2	Screw: RH machine.	No. 3	3/16"	NC 48	Secures carburetor choke plate.
4	Screw: Fil H machine.	No. 8	1/2"	NC 32	Secures carburetor bowl cover.
4	Washer: lock.	No. 8			Used with above.
2	Screw: Fil H machine.	No. 12	9/16"	NF 28	Secures carburetor air horn to main body.
2	Washer: lock.	No. 12			Used with above.
2	Screw: Fil H machine.	1/4"	7/8"	NF 28	Secures carburetor main body to flange.
2	Washer: lock.	1/4"			Used with above.

2. Subassemblies (contd)

Quantity	Item	Size	Length	Thread	Where used
	COOLING SYSTEM				
4	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures fan to water pump pulley.
4	Washer: lock.	1/4″			Used with above.
2	Nut: hex.	3/8″		NC 16	Secures radiator to bottom support.
2	Washer: lock.	3/8″			Used with above.
2	Washer: flat.	3/8″			Same as above.
2	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures radiator brace to upper frame.
2	Nut: hex.	1/4″		NC 20	Same as above.
2	Washer: lock.	1/4″			Used with above.
4	Nut: hex.	1/4″		NC 20	Secures radiator brace to radiator.
4	Washer: flat.	1/4″			Used with above.
4	Washer: lock.	1/4″			Same as above.
1	Nut: hex.	1/4″		NC 20	Secures fan guard to radiator.
1	Washer: flat.	1/4″			Used with above.
1	Washer: lock	1/4″			Same as above.
2	Bolt: hex. head.	1/4″	1/2″	NC 20	Used to assemble fan guard.
2	Nut: hex.	1/4″		NC 20	Same as above.
2	Washer: flat.	1/4″			Used with above.
2	Washer: lock.	1/4″			Same as above.
	D-C GENERATOR.				
2	Bolt: hex. head.	1/2″	2-1/4″	NC 13	Secures d-c generator to unit.
2	Nut: hex.	1/2″		NC 13	Same as above.
3	Washer: lock.	1/2″			Used with above.
4	Washer: flat.	1/2″			Same as above.
2	Bolt: hex. head.	3/8″	1″	NC 16	Secures generator mounting bracket.
3	Washer: lock.	3/8″			Used with above.
1	Bolt: hex. head.	3/8″	1″	NF 24	Generator adjusting arm.
1	Nut: hex.	3/8″		NF 24	Same as above.
1	Washer: lock.	3/8″			Used with above.
1	Washer: flat.	3/8″			Same as above.
1	Bolt: hex. head.	1/2″	1-1/2″	NC 13	Generator adjusting arm.
1	Nut: hex.	1/2″		NC 13	Same as above.
1	Washer: lock.	1/2″			Used with above.
2	Screw: RH drive.	No. 6	1/4″		Secures generator cover, commutator end.
10	Screw: RH machine.	No. 8	3/8″	NC 32	Same as above.
10	Washer: lock.	No. 8			Used with above.
2	Screw: square head.	No. 10	3/8″	NC 32	Same as above.
2	Washer: flat.	No. 10			Same as above.
6	Screw: RH machine.	No. 10	5/8″	NC 32	Same as above.
11	Screw: square head.	No. 10	1-1/4″	NC 32	Same as above.
17	Washer: lock.	No. 10			Same as above.
8	Screw: sch.	1/4″	2-1/4″	NC 20	Secures housing, drive end.
8	Washer: lock.	1/4″			Used with above.
1	Nut: lock.	3/4″		NF 16	Fan and pulley retainer.
1	Nut: hex.	3/4″		NF 16	Secures bearing, drive end.
1	Washer: lock.	3/4″			Used with above.
1	Washer: guard.	3/4″			Same as above.
24	Screw: FH machine.	No. 8	5/8″	NC 32	Field ring assembly.
16	Screw: FH machine.	1/4″	1/2″	NC 20	Same as above.
1	Nut: hex.	No. 10		NF 32	Jumper and plate assembly.
4	Screw: RH machine.	No. 10	1/2″	NF 32	Housing assembly, commutator end.
4	Washer: lock.	No. 10			Used with above.
6	Screw: square head.	No. 8	1/4″	NC 32	Brush rigging assembly.
2	Screw: square head.	No. 8	3/8″	NC 32	Used with above.
10	Screw: square head.	No. 8	5/16″	NC 32	Same as above.
18	Washer: lock.	No. 8			Same as above.
6	Washer: flat.	No. 8			Same as above.
12	Washer: flat.	1/4″			Same as above.
12	Washer: flat.	9/32″			Same as above.
1	Nut: hex.	No. 10		NF 32	Outer collector ring assembly.
2	Screw: RH machine.	No. 6	1/2″	NC 32	Terminal capacitor assembly.
1	Screw: FH machine.	No. 8	5/8″	NC 32	Same as above.
4	Screw: RH machine.	No. 8	3/4″	NC 32	Same as above.
4	Screw: RH machine.	No. 10	3/8″	NF 32	Same as above.
6	Bolt: hex. head.	1/4″	3/8″	NC 28	Same as above.
4	Washer: flat.	1/4″			Used with above.
2	Washer: lock.	No. 6			Same as above.
4	Washer: lock.	No. 8			Same as above.
4	Washer: lock.	No. 10			Same as above.
6	Washer: lock.	1/4″			Same as above.

2. Subassemblies (contd)

Quantity	Item	Size	Length	Thread	Where used
2	Nut: hex.	3/8″		NF 24	Terminal block assembly.
2	Nut: castle.	3/8″		NF 24	Same as above.
2	Nut: hex.	No. 10		NF 32	Same as above.
1	Nut: castle.	No. 10		NF 32	Same as above.
4	Washer: lock.	3/8″			Used with above.
4	Washer: flat.	3/8″			Same as above.
3	Washer: lock.	No. 10			Same as above.
1	Screw: square head.	No. 10	5/8″	NF 32	Same as above.
4	Washer: lock.	No. 10			Fan and pulley assembly.
4	Screw: flat Fil H machine.	No. 10	1/2″	NF 32	Used with above.
	ENGINE SPEED GOVERNOR				
3	Bolt: hex. head.	3/8″	1″	NF 24	Secures governor to bracket.
3	Washer: flat.	3/8″			Used with above.
3	Washer: lock.	3/8″			Same as above.
4	Screw: Fil H machine.	No. 10	5/8″	NC 24	Secures governor end bell to body.
2	Nut: hex.	5/16″		NF 24	Secures control arm eyebolt.
1	Nut: hex.	1/4″		NF 28	Adjustment screw lock.
1	Nut: hex.	1/4″		NF 28	Bumper screw lock.
1	Nut: hex.	1/4″		NC 20	Secures carburetor-to-governor-linkage to the governor.
1	Washer: lock.	1/4″			Used with above.
	FRAME ASSEMBLY				
4	Bolt: hex. head.	1/4″	1-1/2″	NC 20	Secures upper frame to lower frame.
4	Nut: hex.	1/4″		NC 20	Same as above.
4	Washer: lock.	1/4″			Used with above.
8	Screw: RH machine.	No. 10	1/2″	NF 32	Secures rear panel to frame.
8	Washer: lock.	No. 10			Used with above.
2	Screw: RH machine.	No. 10	1/2″	NF 32	Secures tool tray bracket to fire wall.
2	Washer: lock.	No. 10			Used with above.
2	Screw: RH machine.	No. 10	7/8″	NF 32	Secures fire wall to frame.
2	Nut: hex.	No. 10		NF 32	Same as above.
4	Washer: lock.	No. 10			Used with above.
6	Screw: RH machine.	No. 10	1/2″	NF 32	Secures fire wall to frame.
6	Nut: hex.	No. 10		NF 32	Same as above.
12	Washer: lock.	No. 10			Used with above.
6	Screw: RH machine.	No. 10	1/2″	NF 32	Secures radiator cover to frame.
6	Nut: hex.	No. 10		NF 32	Same as above.
6	Washer: lock.	No. 10			Used with above.
8	Bolt: hex. head.	5/16″	5/8″	NC 18	Secures shock mounts to frame.
8	Washer: lock.	5/16″			Used with above.
2	Bolt: hex. head.	1/2″	3-1/4″	NC 13	Secures flywheel housing to mounts.
2	Nut: hex.	1/2″		NC 13	Same as above.
2	Washer: flat.	1/2″			Used with above
2	Washer: lock.	1/2″			Same as above.
2	Bolt: hex. head.	1/2″	3″	NC 13	Secures engine bracket to mounts.
2	Nut: hex.	1/2″		NC 13	Same as above.
2	Washer: lock.	1/2″			Used with above.
2	Bolt: hex. head.	1/2″	1-1/2″	NC 13	Secures engine to bracket.
2	Nut: hex.	1/2″		NC 13	Same as above.
2	Washer: lock.	1/2″			Used with above.
5	Screw: oval-head.	No. 8	3/8″	NC 32	Secures radiator cap door hinge.
5	Nut: hex.	No. 8		NC 32	Same as above.
5	Washer: lock.	No. 8			Used with above.
8	Screw: RH machine.	No. 10	7/8″	NF 32	Secures rear cover hinge to frame.
8	Nut: hex.	No. 10		NF 32	Same as above.
8	Washer: lock.	No. 10			Used with above.
4	Screw: oven-head.	No. 10	1/2″	NF 32	Secures latches to real panel.
4	Nut: hex.	No. 10		NF 32	Same as above.
2	Washer: flat.	No. 10			Used with above.
4	Washer: lock.	No. 10			Same as above.
	FUEL FILTER				
2	Bolt: hex. head.	3/8″	1-1/4″	NC 16	Secures fuel filter to bracket.
2	Nut: hex.	3/8″		NC 16	Same as above.
4	Washer: flat.	3/8″			Used with above.
2	Washer: lock.	3/8″			Same as above.
	FUEL PUMP				
2	Bolt: hex. head.	5/16″	7/8″	NC 18	Secures fuel pump to block.

2. Subassemblies (contd)

Quantity	Item	Size	Length	Thread	Where used
2	Washer: lock.	5/16″			Used with above.
6	Screw: Fil H machine.	No. 10	5/8″	NF 32	Secures fuel pump cover to body.
6	Washer: lock.	No. 10			Used with above.
	IGNITER ASSEMBLY				
2	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures igniter assembly to engine.
2	Washer: lock.	1/4″			Used with above.
6	Screw: Fil H machine.	No. 10	11/16″	NF 32	Cover mounting.
6	Washer: lock.	No. 10			Used with above.
3	Screw: Fil H machine.	No. 8	1”	NC 32	Secures cap to cover.
3	Washer: lock.	No. 8			Used with above.
1	Screw: Fil H machine.	No. 8	3/16″	NC 32	Breaker contact lock screw.
1	Washer: lock.	No. 8			Used with above.
2	Screw: Fil H machine.	No. 10	5/16″	NF 32	Breaker plate mounting.
2	Washer: lock.	No. 10			Used with above.
1	Screw: Fil H machine.	No. 6	5/16″	NC 32	Breaker spring clamp mounting.
1	Washer: lock.	No. 6			Used with above.
1	Washer: flat.	No. 6			Same as above.
1	Screw: Fil H machine.	No. 6	3/16″	NC 32	Capacitor mounting.
1	Washer: lock.	No. 6			Used with above.
2	Nut: hex.	No. 10		NF 32	Coil terminal stud.
2	Washer: lock.	No. 10			Used with above.
2	Screw: Fil H machine.	No. 10	7/16″	NF 32	Coil bracket mounting.
2	Washer: lock.	No. 10			Used with above.
4	Screw: Fil H machine.	No. 6	15/32″	NC 32	Receptacle mounting.
4	Washer: lock.	No. 6			Used with above.
1	Screw: Fil H machine.	1/4″	3/4″	NC 20	Advance arm mounting.
1	Washer: lock.	1/4″			Used with above.
1	Washer: flat.	1/4″			Same as above.
	MUFFLER				
1	Bolt: hex head.	1/4″	5/8″	NC 20	Secures muffler clamp to frame.
1	Nut: hex.	1/4″		NC 20	Same as above.
1	Washer: lock.	1/4″			Used with above.
1	Bolt: hex. head.	1/4″	3/4″	NC 20	Secures muffler clamp to muffler.
1	Nut: hex.	1/4″		NC 20	Same as above.
1	Washer: lock.	1/4″			Used with above.
	OIL FILTER				
1	Bolt: hex. head.	5/16″	3/4″	NC 18	Secures oil filler tube to oil filter bracket.
2	Bolt: hex. head.	5/16″	3/4″	NC 18	Secures oil filter to filter bracket.
3	Nut: hex.	5/16″		NC 18	Same as above.
6	Washer: flat.	5/16″			Used with above.
3	Washer: lock.	5/16″			Same as above.
1	Screw: RH machine.	1/4″	1-1/4″	NC 20	Oil filter bracket.
1	Nut: square.	1/4″		NC 20	Used with above.
6	Screw: Fil H machine.	No. 12	3/4″	NC 24	Secures oil filter cover to bowl.
6	Nut: hex.	No. 12		NC 24	Used with above.
	OVERSPEED SAFETY GOVERNOR				
4	Screw: Fil H machine.	No. 8	3/8″	NC 32	Secures cover to body.
4	Washer: lock.	No. 8			Used with above.
2	Screw: RH machine.	No. 6	5/16″	NC 32	Secures governor throttle plate.
2	Washer: lock.	No. 6			Used with above.
	STARTING MOTOR				
2	Bolt: hex. head.	3/8″	1″	NC 16	Secures starting motor to flywheel housing.
2	Washer: lock.	3/8″			Used with above.
1	Bolt: hex. head.	3/8″	3/4″	NC 16	Secures starting motor ground strap.
1	Washer: lock.	3/8″			Used with above.
1	Bolt: hex. head.	3/8″	3/4″	NC 16	Secures starting motor ground strap.
1	Nut: hex.	3/8″		NC 16	Same as above.
1	Washer: flat.	3/8″			Used with above.
1	Washer: lock.	3/8″			Same as above.
2	Nut: hex.	5/16″		NC 18	Starting motor terminal stud.
2	Washer: lock.	5/16″			Used with above.
1	Washer: flat.	5/16″			Same as above.
1	Screw: RH machine.	No. 10	9/16″	NF 32	Secures connector clamp.
1	Washer: lock.	No. 10			Used with above.

2. Subassemblies (contd)

Quantity	Item	Size	Length	Thread	Where used
2	Screw: RH machine.	No. 10	5/16″	NF 32	Secures inner bearing assembly.
2	Washer: lock.	No. 10			Used with above.
4	Screw: Fil H machine.	No. 10	9/16″	NF 32	Secures frame to pinion housing.
4	Washer: lock.	No. 10			Used with above.
4	Screw: Fil H machine.	No. 10	3/8″	NF 32	Secures commutator end head assembly.
4	Washer: lock.	No. 10			Used with above.
1	Screw: RH machine.	No. 10	1-1/2″	NF 32	Secures cover board.
1	Nut: square.	No. 10		NF 32	Used with above.
4	Bolt: hex. head.	1/4″	3/8″	NC 20	Secures solenoid switch to starter.
4	Washer: lock.	1/4″			Used with above.
1	Nut: hex.	5/16″		NC 18	Solenoid switch terminal.
1	Washer: lock.	5/16″			Used with above.
1	Nut: hex.	No. 10		NF 32	Solenoid switch terminal.
1	Washer: lock.	No. 10			Used with above.
	VOLTAGE REGULATOR AND BASE				
4	Screw: RH machine.	No. 10	1/2″	NC 24	Secures regulator bracket to stator housing.
5	Washer: lock.	No. 10			Used with above.
8	Nut: hex.	No. 8		NC 32	Secures rubber support to base.
8	Washer: flat.	No. 8			Used with above.
8	Washer: lock.	No. 8			Same as above.
6	Screw: RH machine.	No. 10	7/8″	NF 32	Secures electrical leads to base.
6	Nut: hex.	No. 10		NF 32	Same as above.
6	Nut: elastic stop.	No. 10		NF 32	Same as above.
10	Washer: flat.	No. 10			Used with above.
6	Washer: lock.	No. 10			Same as above.
2	Screw: Fil H machine.	No. 6	1/4″	NC 32	Secures regulator core cover.
2	Washer: flat.	No. 6			Used with above.
2	Washer: lock.	No. 6			Same as above.
12	Nut: hex.	No. 6		NC 32	Secures end plates to regulator support rod.
6	Washer: flat.	No. 6			Used with above.
9	Washer: lock.	No. 6			Same as above.
	WINTERIZATION SYSTEM				
4	Bolt: hex. head.	3/8″	3/4″	NC 16	Secures heater to frame.
4	Washer: lock.	3/8″			Used with above.
4	Screw: RH machine.	No. 10	3/8″	NC 24	Secures heater top cover.
4	Washer: lock.	No. 10			Used with above.
1	Screw: RH machine.	3/8″	1/2″	NC 16	Secures heater mounting bracket.
2	Screw: RH machine.	1/4″	3/8″	NC 20	Secures heat exchanger to combustion chamber.
2	Washer: lock.	1/4″			Used with above.
2	Screw: flat Fil H machine.	No. 8	1-1/8″	NC 32	Secures flame switch to bracket.
2	Nut: hex.	No. 8		NC 32	Same as above.
1	Washer: flat.	No. 8			Used with above.
2	Washer: lock.	No. 8			Same as above.
1	Screw: flat Fil H machine.	No. 6	3/4″	NC 32	Flame-switch adjustment.
1	Washer: flat.	No. 6			Used with above.
3	Screw: RH machine.	No. 10	3/8″	NC 24	Secures terminal block mounting plate.
3	Washer: lock.	No. 10			Used with above.
4	Screw: RH machine.	No. 4	3/8″	NC 40	Secures receptacle.
4	Nut: hex.	No. 4			Same as above.
4	Washer: lock.	No. 4			Used with above.
4	Screw: RH machine.	No. 8	5/8″	NC 32	Secures terminal block.
4	Nut: hex.	No. 8		NC 32	Same as above.
4	Washer: lock.	No. 8			Used with above.
1	Screw: RH machine.	No. 10	3/8″	NC 24	Secures blower scroll to heater.
1	Nut: hex.	No. 10		NC 24	Same as above.
1	Washer: lock.	No. 10			Used with above.
4	Screw: RH machine.	No. 8	3/8″	NC 32	Secures blower scroll halves.
4	Washer: lock.	No. 8			Used with above.
2	Nut: hex.	No. 8		NC 32	Secures blower motor to scroll.
2	Washer: lock.	No. 8			Used with above.
4	Nut: hex.	No. 10		NC 24	Resistor terminal stud.
2	Washer: flat.	No. 10			Used with above.
2	Washer: lock.	No. 10			Same as above.
2	Nut: hex.	No. 10		NC 24	Heater electrode stud.

2. Subassemblies (contd)

Quantity	Item	Size	Length	Thread	Where used
1	Washer: lock.	No. 10			Used with above.
3	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures heater air outlet clamps.
3	Nut: hex.	1/4″		NC 20	Same as above.
3	Washer: lock.	1/4″			Used with above.
2	Bolt: hex. head .	1/4″	1/2″	NC 20	Secures heat exchanger pan to oil pan.
2	Nut: hex.	1/4″		NC 20	Same as above.
2	Washer: lock.	1/4″			Used with above.
4	Screw: RH machine.	No. 10	7/8″	NC 32	Heat exchanger pan assembly.
4	Nut: hex.	No. 10		NC 32	Same as above.
4	Washer: flat.	No. 10			Used with above.
4	Washer: lock.	No. 10			Same as above.
2	Screw: RH machine.	No. 10	3/4″	NC 32	Secures terminal block to heater control box.
2	Nut: hex.	No. 10		NC 32	Same as above.
2	Washer: lock.	No. 10			Used with above.
2	Bolt: hex. head.	5/16″	3/4″	NC 18	Heater control box mounting.
2	Nut: hex.	5/16″		NC 18	Same as above.
2	Washer: lock.	5/16″			Used with above.
4	Bolt: hex. head.	No. 10	1/2″	NC 32	Mounts heater fuel control valve.
1	Washer: flat.	No. 10			Used with above.
6	Washer: lock.	No. 10			Same as above.
2	Bolt: hex. head.	1/4″	5/8″	NC 20	Mounts heater fuel pump.
2	Nut: hex.	1/4″		NC 20	Same as above.
4	Washer: lock.	1/4″			Used with above.
3	Screw: RH machine.	No. 6	3/8″	NC 32	Secures fuel control valve strainer cover.
	MISCELLANEOUS				
2	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures engine-to-frame ground strap.
2	Nut: hex.	1/4″		NC 20	Same as above.
4	Washer: lock.	1/4″			Used with above.
2	Nut: hex.	3/8″		NF 24	Secures engine-to-frame ground strap.
4	Washer: lock.	3/8″			Used with above.
1	Screw: RH machine.	No. 10	1/2″	NC 24	Secures hose clip under flywheel housing.
1	Washer: lock.	No. 10			Used with above.
2	Screw: oven-head.	No. 10	1/2″	NF 32	Secures fuel line heat shield.
2	Nut: hex.	No. 10		NF 32	Same as above.
2	Washer: lock.	No. 10			Used with above.
2	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures upper frame to lower frame ground strap.
2	Bolt: hex. head.	1/4″	1/2″	NC 20	Same as above.
4	Nut: hex.	1/4″		NC 20	Same as above.
4	Washer: lock.	1/4″			Used with above.
3	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures fuel inlet fitting to frame.
1	Bolt: hex. head.	1/4″	3/4″	NC 20	Same as above.
4	Nut: hex.	1/4″		NC 20	Same as above.
6	Washer: lock.	1/4″			Used with above.
1	Nut: hex.	1/4″		NF 28	Secures temperature transmitter capacitor.
2	Washer: lock.	1/4″			Used with above.
1	Bolt: hex. head.	1/4″	1/2″	NC 20	Secures oil pressure transmitter capacitor.
1	Nut: hex.	1/4″		NC 20	Same as above.
3	Washer: lock.	1/4″			Used with above.
3	Bolt: hex. head.	No. 8	3/8″	NC 32	Secures wye-delta change board door cover.
3	Nut: hex.	No. 8		NC 32	Same as above.
3	Washer: lock.	No. 8			Used with above.
15	Nut: hex.	1/4″		NF 28	Wye-delta change board terminals.
21	Washer: flat.	1/4″			Used with above.
15	Washer: lock.	1/4″			Same as above.
1	Bolt: FH machine.	1/4″	1-1/2″	NC 20	Hand crank support.
1	Nut: wing.	1/4″		NC 20	Same as above.
1	Washer: flat.	1/4″			Used with above.
4	Bolt: hex. head.	1/4″	7/8″	NC 20	Mounts wye-delta change board.
4	Nut: hex.	1/4″		NC 20	Same as above.
4	Washer: flat.	1/4″			Used with above.
4	Washer: lock.	1/4″			Same as above.
9	Screw: RH machine.	1/4″	1/2″	NC 20	Output terminal suppression capacitor mounting.
9	Nut: hex.	1/4″		NC 20	Same as above.

2. Subassemblies (contd)

Quantity	Item	Size	Length	Thread	Where used
18	Washer: lock.	1/4″			Used with above.
6	Screw: RH machine.	No. 10	2-1/2″	NF 32	Current transformer assembly.
6	Nut: hex.	No. 10		NF 32	Same as above.
6	Washer: flat.	No. 10			Used with above.
6	Washer: lock.	No. 10			Same as above.
2	Screw: RH machine.	No. 10	1/2″	NF 32	Secures current transformer assembly.
2	Nut: hex.	No. 10		NF 32	Same as above.
2	Washer: flat.	No. 10			Used with above.
2	Washer: lock.	No. 10			Same as above.
2	Screw: RH machine.	No. 8	3/8″	NC 32	Secures ten-conductor socket to fire wall.
2	Nut: hex.	No. 8		NC 32	Same as above.
2	Washer: flat.	No. 8			Used with above.
2	Washer: lock.	No. 8			Same as above.
2	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures battery inlet terminal bracket.
2	Nut: hex.	1/4″		NC 20	Same as above.
2	Washer: lock.	1/4″			Used with above.
22	Nut: hex.	3/8″		NC 16	A-c, d-c, and battery terminals.
40	Washer: flat.	3/8″			Used with above.
24	Washer: lock.	3/8″			Same as above.
9	Nut: hex.	1/4″		NC 20	Remote control terminals.
3	Nut: wing.	1/4″		NC 20	Used with above.
18	Washer: flat.	1/4″			Same as above.
6	Washer: lock.	1/4″			Same as above.
4	Screw: RH machine.	No. 10	1/2″	NF 32	Secures battery charging transformer.
4	Nut: hex.	No. 10		NF 32	Same as above.
4	Washer: flat.	No. 10			Used with above.
4	Washer: lock.	No. 10			Used with above.
4	Bolt: hex. head.	No. 10	5/8″	NF 32	Secures relay and battery charging chassis to frame.
4	Washer: lock.	No. 10			Used with above.
1	Bolt: hex. head.	1/4″	5/8″	NC 20	Secures stator housing ground strap.
1	Nut: hex.	1/4″		NC 20	Same as above.
3	Washer: lock.	1/4″			Used with above.

3. Alternator and Compensator Assembly

Quantity	Item	Size	Length	Thread	Where used
	ALTERNATOR				
6	Bolt: hex. head.	5/16″	59/64″	NC 18	Secures rotor to flywheel.
6	Washer: lock.	5/16″			Used with above.
6	Bolt: hex. head.	3/8″	3/4″	NC 16	Secures drive disk to rotor.
6	Washer: lock.	3/8″			Used with above.
6	Bolt: hex. head.	3/8″	1-3/4″	NC 16	Secures stator housing to flywheel housing.
2	Bolt: hex. head.	3/8″	2″	NC 16	Same as above.
8	Nut: hex.	3/8″		NC 16	Same as above.
6	Washer: flat.	3/8″			Used with above.
10	Washer: lock.	3/8″			Same as above.
12	Bolt: hex. head.	1/4″	3/4″	NC 20	Secures bearing cover.
12	Washer: lock.	1/4″			Used with above.
8	Screw: RH machine.	No. 10	3/8″	NC 24	Secures stator lead covers.
8	Washer: lock.	No. 10			Used with above.
6	Screw: RH machine.	1/4″	1/2″	NC 20	Secures screen to stator housing.
6	Washer: lock.	1/4″			Used with above.
	COMPENSATOR ASSEMBLY				
4	Nut: hex.	5/16″		NC 18	Mounts compensator transformer to fire wall.
4	Washer: flat.	5/16″			Used with above.
2	Screw: RH machine.	No. 10	5/8″	NF 32	Secures compensator capacitor bracket.
2	Washer: lock.	No. 10			Used with above.
24	Nut: hex.	No. 10		NF 32	Compensator capacitor terminals.

4. Instruments and Controls

Quantity	Item	Size	Length	Thread	Where used
8	Bolt: hex. head.	5/16″	1/2″	NC 18	Instrument panel shock mounts.
4	Bolt: hex. head.	No. 8	3/8″	NC 32	Secures instrument panel door.
4	Nut: hex.	No. 8		NC 32	Same as above.
4	Washer: lock.	No. 8			Used with above.
4	Screw: RH machine.	1/4″	4-1/4″	NC 20	Secures a-c circuit breaker.
4	Nut: hex.	1/4″		NC 20	Same as above.
2	Washer: flat.	1/4″			Used with above.
4	Washer: lock.	1/4″			Same as above.
2	Screw: RH machine.	1/4″	4-1/4″	NC 20	Secures d-c circuit breaker.
2	Nut: hex.	1/4″		NC 20	Same as above.
2	Washer: flat.	1/4″			Used with above.
2	Washer: lock.	1/4″			Same as above.
2	Screw: RH machine.	No. 8	3/8″	NC 32	Secures duplex receptacle.
2	Nut: hex.	No. 8		NC 32	Same as above.
2	Washer: flat.	No. 8			Used with above.
2	Washer: lock.	No. 8			Same as above.
2	Screw: RH machine.	No. 8	5/16″	NC 32	Secures voltmeter selector switch.
2	Washer: lock.	No. 8			Used with above.
2	Screw: RH machine.	No. 6	3/8″	NC 32	Secures heater circuit breaker.
2	Washer: lock.	No. 6			Used with above.
3	Screw: RH machine.	No. 4	5/8″	NC 40	Secures frequency meter to panel.
3	Nut: hex.	No. 4		NC 40	Same as above.
3	Washer: flat.	No. 4			Used with above.
3	Washer: lock.	No. 4			Same as above.
12	Screw: RH machine.	No. 6	5/8″	NC 32	Secures voltmeter and ammeters to panel.
12	Nut: hex.	No. 6		NC 32	Same as above.
12	Washer: lock.	No. 6			Used with above.
1	Screw: RH machine.	No. 8	3/8″	NC 32	Secures switch guard.
1	Nut: hex.	No. 8		NC 32	Same as above.
1	Washer: flat.	No. 8			Used with above.
1	Washer: lock.	No. 8			Same as above.

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